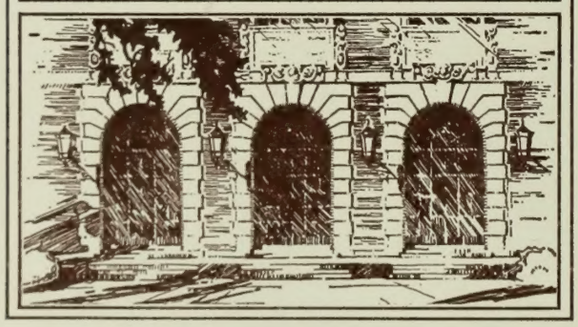
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UNITED STATES AIR FORCE • JANUARY 1970

Aerospace SAFETY

THE MAGAZINE DEVOTED TO YOUR INTERESTS IN FLIGHT



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JANUARY 1970 AFRP 62-1 Volume 26 Number 1

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Lt Gen S. W. Wells • Inspector General, USAF
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Brig Gen B. H. King • Director of Aerospace Safety
Col William J. Murphy, Jr. • Chief, Flight Safety Division
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Perhaps you've already seen page one or the back cover and know that there is going to be a big change for this old book. So beginning with the March issue watch for **Aerospace Safety** to contain both flying and maintenance oriented material.

You'll notice the request that you submit titles for the new combined magazine. We are looking for ideas and there are bound to be a lot of them out there, so how about letting us hear from you? Here's a chance for all of you to write that letter to the editor.

Meanwhile, this issue deals with some of the problems of today. To start off with we have an article about flight leaders. Whether you are the **Lead** or the **led,** the examples given and the discussion of qualities that a good flight leader possesses will be of interest.

The world around us is full of distractions. The trick is not to let these distractions distract one. Now that may sound like a lot of double talk but it isn't really. Read the article "Distraction Factor" beginning on page 8.

Most of the articles this month deal with people. Two, however, concern hardware. You young jocks probably think the F-100 has been around forever. Well, it almost has; in fact, it has become a sort of fighter pilot's Gooney Bird. And what's more, as the article on page 20 points out, with some mods, it may go another 10-20-30?? years. Wanna bet?

Aircrews will be getting new flying suits soon. Made of a fabric that is said to be more fire resistant than the current K-2B suit material, the suits should begin to show up immediately. You'll find the details on page 23. ★

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Safety Magazines To Be Combined

Three major Air Force safety magazines are about to become one. Brigadier General B. H. King, director of Aerospace Safety, announced that effective with the March issue, **Aerospace Safety, Aerospace Maintenance Safety** and the **USAF Nuclear Safety** magazines will be combined. In announcing the merger, General King said that suggestions for a title for the new monthly magazine are solicited from all Air Force personnel.

Aerospace Safety, aimed primarily at aircrews and operations support personnel, is the granddaddy of Air Force safety publications. It began as a safety pamphlet produced by the Air Transport Command during World War II, and has since been in continuous publication. When the Air Force became a separate service, the magazine took on the title **Flying Safety.** In 1960 the title was changed to **Aerospace Safety** to reflect the expanded Air Force role in missile and space safety.

Aerospace Maintenance Safety, previously **Aircraft Accident and Maintenance Review,** is the Air Force magazine tailored specifically for the technician. It began as a weekly summary of aircraft accidents in 1946 and started publication as a 32-page monthly magazine in 1951.

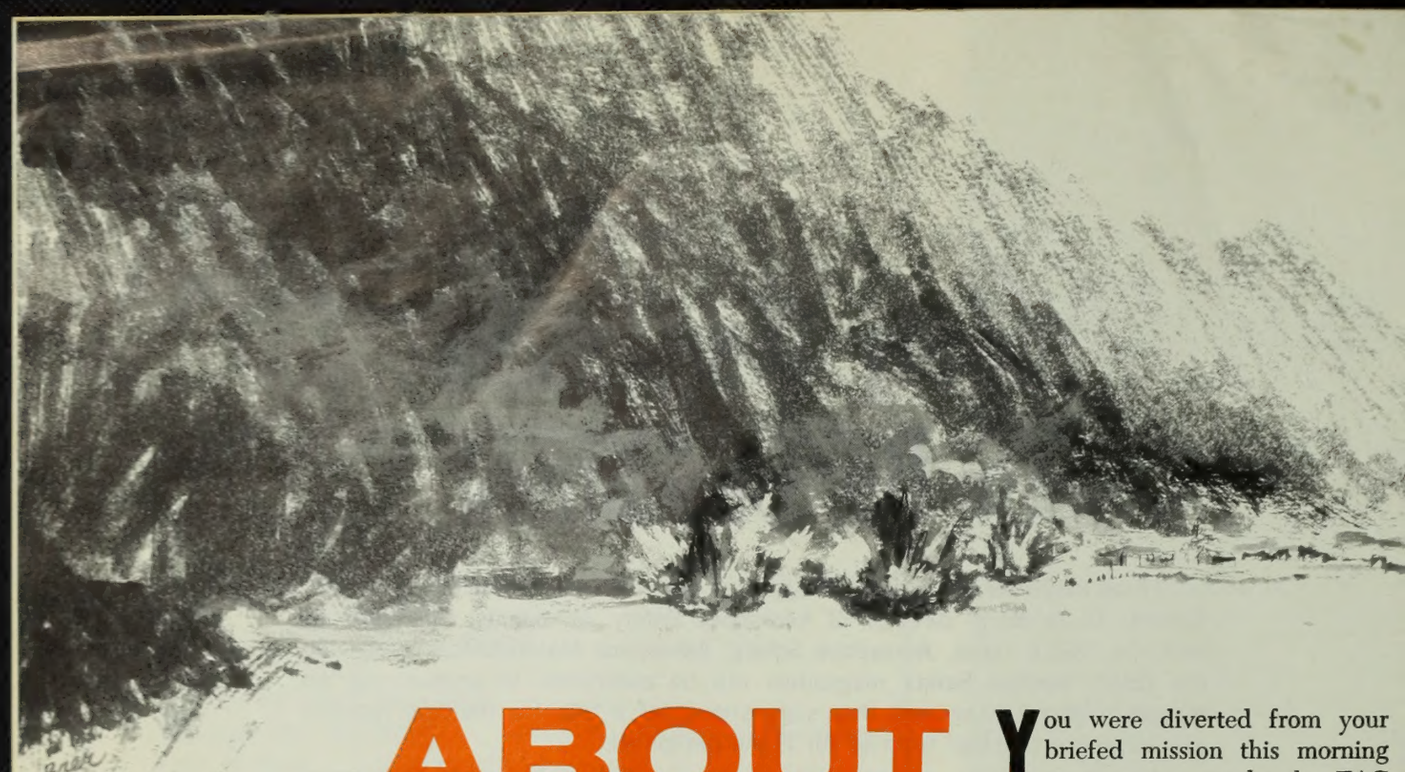
Nuclear Safety, published quarterly since 1961 by the Directorate of Nuclear Safety at Kirtland AFB, has addressed all aspects of the prevention of nuclear mishaps. Covering the wide range of nuclear materials handling, storage and transportation, this magazine has been distributed to all USAF organizations involved in nuclear operations, as well as many US Army and Navy units and the Atomic Energy Commission.

The new consolidated magazine, to be published by the Directorate of Aerospace Safety under the auspices of The Inspector General, will cover accident prevention information in all areas of Air Force operations. Major emphasis will be in the areas covered by the three previous magazines: aircraft, missile and nuclear operations and maintenance. Also included will be articles oriented toward safe and efficient handling of support equipment and special purpose vehicles.

The name for the new accident prevention magazine should be short (preferably one or two words) and readily identifiable with the Air Force and its mission. The title selected will be the one that best reflects the objectives of the magazine: to promote efficient, accident-free performance by the people engaged in all aspects of Air Force operations.

Due recognition will be accorded to the individual submitting the most appropriate entry.

Suggestions for the name of the new magazine may be submitted on the cut-out coupon from the back cover of this issue, or on plain paper to: The Directorate of Aerospace Safety, AFIAS-E1, Norton AFB, CA 92409, and must be received by 1 Mar 70. ★



ABOUT THE FLIGHT LEADER

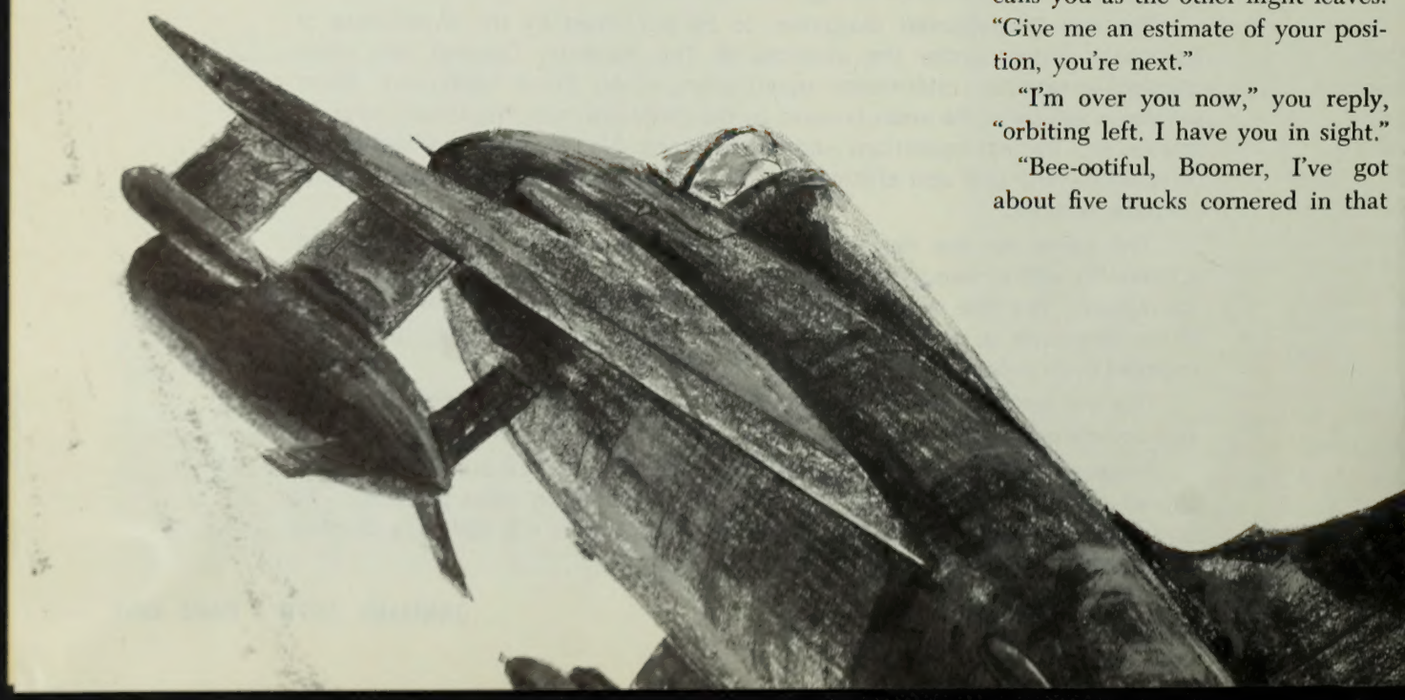
You were diverted from your briefed mission this morning to get some trucks the FAC has cornered. When you call him he gives you a quick description of the target and his position. Then he tells you to stand by.

You know the area he describes. You've seen it many times in the nine months you've been in SEA. As you listen to the FAC working another flight, you can visualize the terrain. When the last man in the flight ahead calls off target you are just arriving in the area. You spot him, then the rest of the flight and the FAC in rapid order.

"Okay, Boomer Flight," the FAC calls you as the other flight leaves. "Give me an estimate of your position, you're next."

"I'm over you now," you reply, "orbiting left. I have you in sight."

"Bee-ootiful, Boomer, I've got about five trucks cornered in that



patch of trees off my left wing . . . north of the road . . . against the karst."

Before the FAC marks the trucks he gives you a full description, their elevation, his estimate of the surface wind. When you've rogered that, he goes over defenses in the area . . . moderate automatic weapons fire, escape heading for immediate bailout, and location of the nearest friendlies . . . 15 miles west. You catch your thoughts wandering before he is finished . . . you've worked in this valley many times before. You know the bailout heading and the location of the friendlies.

"Okay, Boomer Lead," the FAC's voice changes. "Let's make passes west to east. Mix them up a little, but go toward that hillside . . . they're tucked in pretty tight against the karst."

Pulling back up for your second pass, you watch the flight roll in and deliver. They're varying their run-ins enough to keep the gunners off balance, but they're placing the ordnance right where the FAC wants it.

"You're getting ground fire from the top of the hill, Three," the FAC's voice is matter - of - fact. "Four, if you have time, move it 200 meters east to the top of the ridge . . two guns up there firing now . . . Lead, roll in from your position to cover him . . . north to south . . . north to south . . ."

"Lead's in with guns." You were rolling in when he called. "Move it around, Four; they're tracking you . . ."

As Four releases and starts his pullout, you see something sparkling on his fuselage, aft of the cockpit.

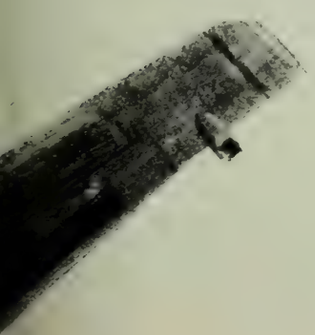
"I . . . I think I'm hit . . ." Four sounds completely surprised. He is jinking as he pulls off over the hill. The airplane looks intact, no smoke, no fire . . . and he seems to be under control.

You bend your airplane hard toward him as his voice calms down. "Compressor stalls, Lead. No power . . . control's okay, though . . . trying to climb."

Then you see that he is still heading east, toward the bad guys and away from the friendly ground troops.

"Bring it around to the west, Four . . . 180 to the left . . . head west! I'll catch you in the turn. Don't go any farther east!" You see him start the turn, then you ask, "How's the motor, Four? Is it gonna last till we cross the river?"

"Dunno." His answer is brief and curt. He's busy in the cockpit. It doesn't sound good. "How far is the river, Lead? I can't stay with this very long . . . smoke in the cockpit."



Hit on his first pass, Four headed the wrong direction. The friendlies were behind him. If ever he needed a good leader, now was the time.

As you close on him you realize Four doesn't know the area. This is only his ninth or tenth mission. Nothing looks familiar to him yet. In fact, he doesn't really know where he is!

"Lead, I'm going to have to get out . . ."

"Hold on, Four, hold on," you interrupt quickly when he releases the mike button. "Stay with it as long as you can. See that long ridge curving to the north? Beyond that is good guys . . . can you get that far?"

"EGT's pegged . . . getting hotter 'n hell in here . . . but I have control. I can fly the bird."

"Okay, good. It's your show, but stay with it as long as you can . . . get over that ridge." You hear the FAC on guard channel, calling the rescue forces. "The Jollys are on their way, Four."

He crosses the ridge with about 2000 feet to spare. When he ejects, you estimate he is five miles into good guy country. His chute blossoms and then almost immediately disappears into the jungle. Without taking your eyes off the spot where the chute disappeared, you set up an orbit and start to refine your estimate of his position. The FAC is just arriving in the area when you hear Four come up on his radio. He is okay. You begin to relax.

Low fuel forces you to leave before Four is aboard the Jolly, but the situation is under control. On the way home you hear that Four is on the chopper and in good shape. Thank God, you think, he got that bird over the ridge and away from the hostile area.

Without you he probably would have continued heading east until he was forced to eject. Unfamiliar with the area, very busy in the cockpit the entire flight, and then hit on his first pass, Four was close to saturation. Escape to the west, which was automatic reaction to you, required that Four concentrate on the FAC's instructions and then recall them now that he was in trouble.

Four needed a flight leader. And he had a good one. The system worked as designed, and Four lived to fly another day.

The flight leader's position is one of grave responsibility, not just a position of authority and status. And this responsibility is much broader than merely leading his flight through the air to the target and back.

Unfortunately, not every pilot flying lead in a flight understands this responsibility. Take a recent incident:

Shortly after takeoff, Nr Two in a flight of F-100s found that his afterburner would light every time he moved the throttle to about 87 per cent. Flight Lead decided to continue the mission, climbing in burner. After descending in the vicinity of their briefed target, they were diverted. Making another burner climb, and a gradual descent to the second target, they salvoed ordnance and started home. Climbout was in burner again.

Nr Two, who had been doggedly hanging on all this time, found he was down to 2400 pounds of fuel when they were 130 miles from the landing base. At 65 miles he had 1200 pounds and jettisoned tanks and pylons. At 8500 feet, 25 miles from the field, he flamed out, showing 600 pounds in the forward tank. He managed to get the engine relit and flew another 15 miles before the engine flamed out again.

He ejected ten miles from the field.

The accident board found the primary cause was supervisory factor: The flight leader continued the mission when his wingman had a known malfunction which affected safety of flight.

Too frequently, an inexperienced wingman, accustomed to following the direction of his superiors, will follow his leader into situations he probably would not enter if left to his own judgment.

But a good wingman follows his leader anywhere! And a good wingman doesn't question his leader's judgment.

Now, about the good flight leader . . .

- He has broader, longer experience than his wingman. When problems arise he thinks of more and better alternatives. He chooses the best course of action and reaches a sound decision more rapidly than his wingman.
- He can safely take more imaginative action in a tight situation, because he has a better understanding of the variables involved. He's been there before, knows what's on the other side of the ridge. More at ease than his wingman, in a familiar environment, he observes more and understands more of what is going on around him.
- He can better evaluate all aircraft malfunctions because he knows the machine better than his wingman. Generator failure, TACAN failure, low fuel state, hung ordnance . . . he better understands the impact on mission accomplishment and safe recovery.
- With more knowledge of the mission, he can rapidly evaluate a tactical situation and arrive at an efficient tactical plan. Freed of much of the concentration on switchology and pattern flying that occupies his wingman, he rapidly relates terrain, defenses, weather and target to the mission objective. He plans tactics for the entire flight as the situation develops, or he evaluates and accepts or rejects the plan presented by the FAC, with his wingman's abilities always in mind.

In summary, a good flight leader accepts all the responsibility for successful completion of the mission, keeping in mind his wingman's proficiency, experience and knowledge. ★

the I.P.I.S. approach

By the USAF Instrument Pilot Instructor School, (ATC)) Randolph AFB, Texas

NEW HOLDING PROCEDURES

The *Terminal Air Traffic Control* Manual, ATP 7110.8, states: "The most generally used holding patterns are charted on terminal area and approach charts and high and low altitude enroute charts published by U.S. Coast and Geodetic Survey."

Airman's Information Manual, Part I, Departure, states: ". . . and when reaching the clearance limit, begin holding in accordance with the holding pattern depicted on the Coast and Geodetic Survey Chart for the clearance limit . . ." In addition, from the Enroute section: "Pilots are expected to hold in the pattern depicted unless specifically advised otherwise by ATC (Effective October 1, 1969)."

Holding patterns may be depicted on United States Government FLIP Enroute High, Low or Area Charts beginning with the November 1969 issue. Pilot procedures in FLIP are changed to comply with these new air traffic control procedures. The change in procedure requires the pilot to maintain the last assigned altitude and enter the holding pattern depicted on the appropriate chart for the clearance limit. If the clearance limit is enroute, enter the holding pattern shown on the appropriate enroute chart—high, low or area. If the clearance limit is your IAF, enter the pattern depicted at the IAF on the terminal chart. If a pattern is not depicted and holding instructions are not received, hold in a standard pattern on the course on which you approach the fix.

Remember—if a holding pattern is depicted, the controller is required to issue direction of holding and an EAC (expected approach clearance) or EFC (expect further clearance) time, in which case the pilot is expected to enter the depicted pattern. The controller will issue general holding instructions only when a pattern other than the one depicted is to be used.

NOTE: An important point for pilots to remember is that holding procedures upon reaching an initial approach fix (IAF) while experiencing two-way radio communications failure are not changed.

MISSED APPROACH HOLDING PATTERNS

Missed approach holding patterns are being depicted on many Low Altitude Instrument Approach Procedure Charts. There are usually two ways to determine if the depicted holding pattern is a missed approach holding pattern. First, the missed approach holding pattern in the plan view will be shown in 45 per cent of color. The depicted pattern and the associated leg bearings will not be as dark as a normal holding pattern depicted at the initial approach fix (IAF) and used for holding prior to starting the instrument approach. The line width is the same for both the missed approach holding pattern and the normal pattern. Another way to identify a missed approach holding pattern can be found in the missed approach instructions in the profile view. These instructions will include directions to proceed to a fix and hold. The intent of these instructions is for the aircraft to hold in the depicted missed approach holding pattern.

Caution should be exercised to prevent confusing a missed approach holding pattern with a normal holding pattern. One could easily be mistaken for the other under poor lighting conditions. The missed approach holding pattern should be used *only* when executing the missed approach.

USAF IPIS GREETINGS

January 1970 marks the fifth year of continuous monthly IPIS Approach articles. During this time, it has been our privilege to serve as the "sounding board" for many perplexing questions from the field relating to instrument flying techniques and procedures. Continuous revisions to manuals, regulations and documents (e.g., AFM 51-37, JAFM 55-9, TERPs, and FLIP) will prompt many new questions and problems which will require interpretations and answers. Let IPIS be your representative in finding the solutions. We solicit and encourage your interest and participation in the formulation of procedures that will prove to be mutually acceptable to all.

The USAF IPIS hopes that each of you enjoyed a safe and merry Christmas and extends best wishes for a very happy and prosperous 1970.

H. E. ALLSHOUSE, Lt Col, USAF
Commander, USAF IPIS ★

THE WASH OF THE WHIRLEE CHOPPER



Major Pierre Beaucoup and Captain C. Z. Chumley stood watching what had been a proud (venerable, but proud) C-47 slowly being consumed by flames. Firemen were rushing to the scene, but even as they began to pour foam on the burning aircraft, the dejected pair of watchers knew the Goon would never be the same.

The day had started out routinely enough. Pierre, an IP in the C-47, was in the right seat checking out C.Z. as an AC in the left seat. During the takeoff roll everything was satisfactory until trouble in the form of a helicopter appeared up wind from the C-47 and flew along parallel to the runway.

The first indication that they might have a problem came when the C-47 veered slightly to the right, then to the left. Pierre took over and straightened the aircraft. It lifted off at takeoff speed and was flying straight and level when he told Chumley to raise the gear.

Then the helicopter made a right turn and the full effect of its rotor wash was directed toward the Gooney which rolled into a 30 degree right bank and pitched up slightly. Pierre did all he could to correct the roll but the aircraft did not respond. When he lowered the nose in an attempt to regain control, the aircraft settled back to the runway, slid to a grinding stop and began to burn. The pilots and the sergeant mechanic escaped with only minor nicks, bruises and singes, but the airplane. . . .

Later over a cafe au lait in the cafe au lait shoppe, the two aviators discussed the events that preceded the demise of one each Bird, Gooney.

"I 'ave been reading some of ze back issues of ze safety magazines given to me by l'officer de safety," said Pierre, "and I 'ave learned zomesing.

"We were the veectems of zat crazee helicoptaire zat fleu along beside us. My friend, do you know w'at 'oppen to us?"

Chumley replied that he was new to the theater, hadn't flown around helicopters before and, furthermore, if the chopper was in any way responsible, didn't ever want to see another.

Pierre agreed with Chumley, but being a more mature individual, pointed out that living with helicopters operating from the same bases was a way of life in SEA. "But ere is w'at 'oppen," he said. "You are no doubt familiar, mon ami, with w'at is call ze wake turbulence to be found behind feexed weeng aircraft . . ."

Chumley nodded.

"Well, ze helicoptaires, 'ave ze same thing, only eet ees call rotair wash, comprenez-vous? An' eet ees very dangerous at low altitude. You see, helicoptaires are quite maneuverable, w'ich means zat zey do not 'ave to operate within such narrow leemeets as feexed weeng aeroplanes. Zey can land any place and frequently do. We mus' line our aeroplane up weeth ze runway on final and then land on ze runway. Not ze whirlee chopper. He can fly alongside ze runway like zat one today and land any place he weeshes.

"Now, he ees doing zat when along comes a happy fellow een hees aeroplane and . . . voila! We 'ave a somew'at bent machine.

Peecture, if you weel, mon ami, ze rotair wash from each side of ze rotair, flowing back behind zat crazee machine. Les vortices, zey are call. Now zey flow back from a forward moving machine, and zey slowly seenk toward ze surface. As les vortices near the ground —at, say, about one-third ze rotair diameter from ze surface—zey stop settling and spread laterally. Zat is sideways, mon ami.

"Weend becomes veree important w'en the whirlee chopper is operating near the runway. As a rotating vortex moves laterally toward a runway, a light weend from ze opposite direction might just offset the lateral speed of the vortex, causing it to remain stationary on the runway. Pairhaps zat ees w'at 'oppen to us."

Chumley ordered another cafe au lait and pondered Pierre's words against a mental picture of the wreckage of the C-47. "I've heard of O-1s and other light planes getting into trouble in rotor wash and wake turbulence," he said, "but I didn't expect any trouble with a bird as big as the Goon."

"Ah, mon ami, zat is w'ere lots of fellows 'ave got into trouble. Zey thought only in terms of light aeroplanes. Well, let me tell you, ze fact ees that aeroplanes of all sizes 'ave been guillotined — C-7s, C-130s, OV-10s, O-2s and O-1s just to mention a few. And zey are mos' vulnerable w'en flying low and slow because at such speed zey may lose control and stall at an altitude from weech they cannot recovair. Comprenez-vous?"

"I think I've got the picture," said C.Z. "From now on I'll keep my distance from choppers. Since the vortices sink, I'll fly at the same altitude or higher than the helicopter when crossing behind it and I'll stay upwind when possible. When landing, if I can't land upwind I'll make sure to give the wash a few minutes to settle down before landing into it."

Pierre smiled and twisted the horns of his moustache. "I believe, mon ami, zat we 'ave learn ze secrets of operating safely—at least reasonably safely — around zose whirlee choppers. Come, eet ees time to go testify before ze accident board." ★



IT IS NOT ALWAYS APPARENT,
BUT IN MANY ACCIDENTS THERE WAS THE . . .

DISTRACTION FACTOR

Like quizzes? Why not take a minute — just one — to try this one. Then decide whether you need to read on.

1. It's Saturday morning and you are mowing the lawn when a stunning young lady with the longest legs and shortest mini skirt you ever saw saunters by. You

 A. Continue mowing and pay no attention.

 B. Smile in a friendly but reserved manner and continue about your business.

 C. Stare so hard that you forget what you are doing and drive the mower through a row of your wife's prize petunias.

2. You are driving on the freeway at relatively high speed during a busy part of the day when your eye is caught by an interesting sign off the freeway. You

 A. Concentrate on driving and ignore the sign.

 B. Look at the sign for a moment and when you look back find that your car was about to leave the lane you are in.

 C. Look at the sign too long, your car drifts and your right front fender grazes the car in the next lane.

3. You are at work, on a night formation mission flying on Lead's right wing. Since his NAV equipment is out, he asks for bearing and distance to a fix and you look into the cockpit long enough to get the coordinates from your inertial guidance computer. When you look back

 A. Lead is right where he was when you turned your head away.





B. You have moved in a bit and must move back out to avoid hitting Lead.

C. Lead's wing is right in front of your windscreen and there's no way to avoid a midair.

If you answered A to all of these you are numb, lucky, or superhuman and need read no farther. But if you are a normal man and marked some B's or C's, read on.

Ever since Eve turned Adam's head, men have been victims of what we call *distractions*. Distractions come in all sizes, shapes and descriptions. Some are pleasant, some not. Some are sudden, some come on slowly. Some are soft and subtle while others smack you like a tackle for the Rams.

Some are benign. Some are deadly. There is no way of accurately tabulating the latter because of the finality of the results. We don't really know the magnitude of the problem because we can't positively relate distraction to very many fatal accidents. The best we can do is look at the results of distraction on a pilot when it is known and accounted for.

Distractions occur with great frequency, probably to each of us every day. Fortunately they don't often occur at a critical moment in a potentially hazardous endeavor. When they do, and no accident results, we usually don't find out about it. So we don't know about those. With this vacuum added to those who can't tell us because they are dead, we are left with relatively few experiences upon which to base judgments and make recommendations.

The "accounted for" events are of value, however, in detecting potential hazards and devising means of prevention.

Anyone is subject to distraction, but the inexperienced are probably more prone. This may be because this person has his hands full doing his job and a distraction may be more than he can cope with: in other words he becomes oversaturated.

An example of this occurred when a student pilot became distracted by a surging engine and other aircraft in the traffic pattern. This young man made a few mistakes—like lowering full flaps instead of half, letting his airspeed and altitude get low, pulling the mixture control to lean (off)—that resulted in a forced landing in which he stalled the aircraft some 15-20 feet off the ground.



DISTRACTION FACTOR . . .

While the primary cause was found to be pilot factor in that the student misinterpreted engine surge as an engine malfunction and cut off the fuel, his actions seem to have been conditioned by inexperience, an abnormal situation and *distraction.*

A discussion of distraction in relation to aviation usually brings to mind the classic case of the pilot whose attention was diverted during his before-landing check and he forgot the gear. Fortunately that one is rare nowadays, but it still happens. Here's one a bit different.

On a low-level photo-recce mission the pilot was flying at 500 to 800 feet AGL for an oblique photo. Perhaps this one would be better labelled target fixation. Nevertheless, this pilot was looking at the target rather than at his flight path and the aircraft hit the top of a tree. He was real lucky and got back with a scratched bird instead of ending up as a statistic buried in a smoking hole.

Maneuvering flight at low level allows little time for anything but tending to the job at hand. A wandering mind can't hack it. This is where just a momentary lapse can cost one his life.

Although no one knows for sure, it was suspected that such a momentary distraction was fatal to a young pilot. Evidence indicated that during a gunnery pass the pilot may have attempted to reposition a gun camera switch and flew into the ground.

A B-52 was destroyed when an instructor pilot diverted his attention while a student IP was performing a very demanding maneuver. For just a few seconds, while the aircraft was nearing the ground on final approach, the instructor concentrated on changing radio channels. When he looked up he saw they were in trouble, but it was too late to prevent the accident. The aircraft hit short of the runway in a nose-low position and the gear was wiped out. After sliding nearly 7000 feet it was destroyed by fire.

While the term diversion may be semantically more exact than distraction in this case, we needn't get too picky because the results could be the same.

Some distractions are desirable. For example, we use lights and sounds to attract a pilot's attention, which in turn distracts him from what he's doing. In this case, it is desirable to call his attention to an abnormal or potentially dangerous situation, such as gear not down prior to landing, a fire warning, a pre-set alarm that tells the pilot that he is at a minimum altitude.

Regardless of whether the distraction is the result of some unforeseen event or a built-in safety device, the effect on the pilot can be the same: it can cause over-concentration on one item to the detriment of the effort as a whole; it can cause an interrupted sequence not to be completed; it can result in confusion and disorientation.

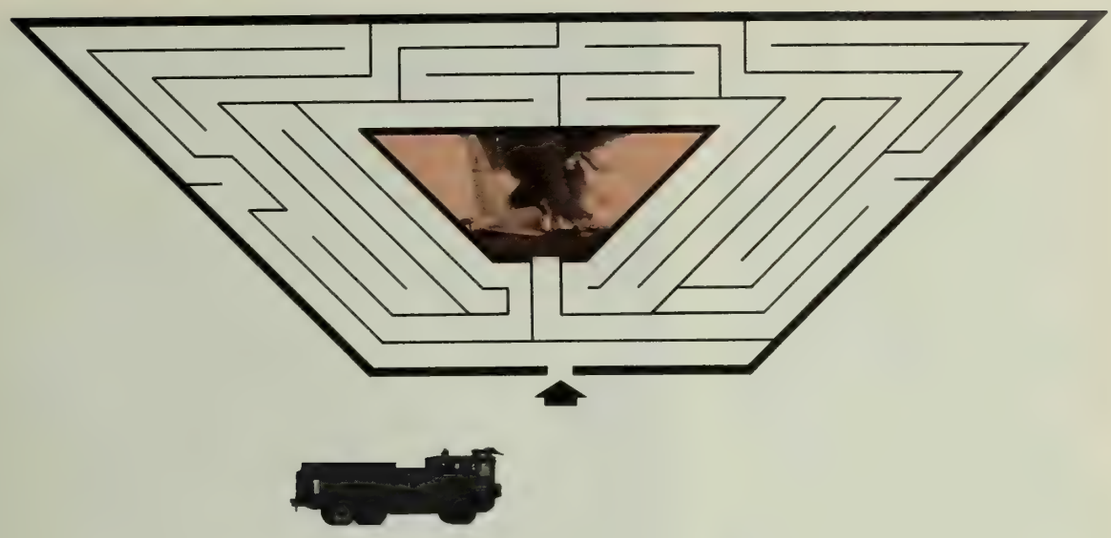
Now all of this sounds pretty bad and one wonders if there is anything that can be done about this problem. Here are some suggestions based on experience, accident investigation findings, and ideas borrowed from others.

- First, the individual can help himself by knowing his equipment. This is particularly true for younger, less experienced pilots, or for even the old heads who are transitioning into an entirely different kind of aircraft and mission. Knowledge is power (and safety) when something unexpected occurs and the remedy depends on the pilot doing the right thing almost instantaneously. Knowledge also permits the pilot to determine when he has to act immediately and when he has time to take stock and move a bit more leisurely.

- Discipline plays an important role in overcoming the insidious effects of distraction. One must tend to first things first. Discipline depends on knowledge, in this context, and the combination of knowledge and discipline permits the pilot to establish priorities and exercise options. In short, give himself all the maneuvering room possible.

Finally there are mechanical aids – lights, bells, horns, etc. These, of course, are distractions themselves and, unless dealt with intelligently, present their own hazards. Some of the newest systems now appearing are virtually foolproof. For example, one system that is being considered for a commercial airliner includes a checklist that cannot be advanced to the next step unless a previous step has been accomplished. This may be varied by permitting steps to be taken out of sequence but those missed keep showing up on a lighted panel until they have been accomplished.

Devices like these no doubt will save airplanes and lives. But machines can't do all our thinking, especially when judgment is necessary to determine the next course of action. That is work for a man. ★



CAN YOU GET THERE FROM HERE?

Maj David L. Elliott, Directorate of Aerospace Safety

Crash grid maps have been a constant headache for all people concerned. Many hours are spent updating these maps, striving to keep them always accurate and, most important, depicting all access roads to every area on the map. Changing conditions, construction on the airfield, even the change of a parking plan, can cause major changes in the crash response to any given accident. This subject has been stressed to the point that crash map maintenance has become a sore thumb — perhaps because the actual valid requirement is not in sight.

You would think that in this day and age the statement below just couldn't occur: "Crash response was timely up to the point that the trucks reached the large ditch and could proceed no closer to the accident. The pilot was already being removed from the burning aircraft by personnel who were closer to the area. Because of the intensity of the fire and the exploding ordnance it would not have been feasible to risk lives and equipment in controlling the flames once the pilot had been removed. Two crash rescue crews reacted promptly to the crash alarm. Unfortunately they . . . were not aware of an existing alternate path to the aircraft. Although crash grid maps are carried in all crash trucks, none indicated a large impassable ditch in that area. It was learned that many crash crew personnel were not aware of the ditch. There was no plan to bypass this ditch or other obstacles which might hinder access to accidents within the field boundaries."

The principal lesson is that the crash grid map is a tool. It is a training aid and a road map. It should reflect all changes that could in any way affect response to a crash.

The first step is not to drive down the flight line to check the map, but to establish a plan that will guarantee the map is updated when changes occur. A Master Crash Grid Map should be maintained by the Fire Marshal or the Fire Chief. Any change of parking plan, any construction or ditch digging should be coordinated by requirement with the man in charge of this Master Grid Map. An operating instruction that requires a dated monthly or weekly check of all access roads should be in existence and working.

An update system for all existing crash grid maps should be in existence to insure that all maps are kept up-to-date. And most important of all, all crash rescue personnel should receive timely instructions on changes in access routes to all areas.

During periods of construction even daily changes may be required. Check your crash grid map maintenance plan. If you don't have a plan—get one. If it doesn't provide for all contingencies, rewrite it. Then check it. If it doesn't work—rewrite it again. ★



THE HARD WAY-EXPERIENCE

There are many ways to break an airplane. They range from a complicated, and lengthy chain of events, building for months before the accident happens, to the ultra-simple. You would think that the straightforward or easily understood single-acts would generate straightforward and easily understood preventive action. Unfortunately, when a pilot's accident-causing error stems from a lack of experience, the answers aren't all cut and dried.

Take accidents that follow a loss of control in the turn to final. The classic pattern involves an over shoot in the turn to final, approach to a stall, high sink rate, possibly uncontrolled yaw or roll, depending upon the particular airplane's characteristics. Then in rapid sequence follow: go-around instructions from the ground, a final attempt at power and/or control application, delayed ejection and impact short of the runway.

What's the problem? you say. Landing patterns are pretty basic. Anyone who allows himself to be caught by increased stall speed in the turn, or excessive angle of attack on final, just doesn't understand the problem and needs more instruction. Preventive action: training and supervision.

You're right. No argument. But lets add one more—experience. You don't often find an old, experienced head involved in this type of accident. He may get sloppy or careless, and find himself looking trouble right in the face, but he's been there before. He rapidly processes the numerous information inputs of airspeed, angle of bank, crosswind, power, rate of descent—and airplane feel. Without a great amount of conscious thought, he corrects away from the impending stall. He saves the approach if it is within reach, or he admits his error and goes around.

The less experienced pilot, the new head, doesn't have it quite so easy. He hasn't been there often enough to make his reactions as automatic as they are for the old head. It takes him longer to evaluate and process the information he's receiving. Sometimes it takes him too long, and he finds himself in a situation that is new to him and beyond his capabilities.

- An F-100 pilot returning from a combat mission entered closed traffic from a practice instrument missed approach. He had encountered a stiff crosswind during the approach, but placed his downwind in a normal, no-wind position. Turning base, he was very close to the runway, and as he progressed around the turn his bank angle increased steadily. When he was about 500 feet above the ground in

a 45-degree bank and obviously overshooting, Mobile told him to go around. He added power but his bank increased rapidly to almost 90 degrees as adverse yaw took over. At about 200 feet, the pilot initiated ejection and the bank began to decrease. Seat separation occurred before the pilot impacted the surface, but his parachute did not have time to deploy. He had less than 300 hours flying time since his graduation from UPT.

• An AT-33 pilot, with 800 hours multi-engine time and about 25 hours in the T-bird, found himself returning with unexpended ordnance after aborting a range mission. He had been briefed on the local hung ordnance pattern but had never flown it. Entering on a 45 to downwind, he turned to parallel the runway when he was almost over it. Realizing his error, he banked sharply away from the runway, then reversed the turn to come around to a base leg. He was still in too close. As his bank increased from 60 degrees to almost 90, and his nose dropped 45 degrees below the horizon, the Mobile controller instructed him to go around. The response was very slow, the aircraft continued in an 80-degree bank with the nose very low. Approximately 100 feet above the ground the airplane came to an almost wings-level attitude and the nose started to come up. Rate of descent continued high; the aircraft impacted almost wings-level. The pilot did not eject.

The low-experience pilot is actually processing more information in this type of situation than a more experienced pilot. He has been taught a specific pattern and is concerned when he is five knots off his airspeed, or fifty feet off altitude. He is not very far removed from a training situation—or he may still be involved in training—where emphasis is placed on doing it right the first time. More of his attention is devoted to flying (or correcting to) a precise pattern. In correcting his position in relation to the runway, he diverts too much attention from airspeed, power or bank angle. When his attention does come back to these parameters, it may be too late to safely continue the approach. But he tries to save it because he doesn't know it is too late. He hasn't actually been there before, doesn't realize that he's nearing the point of no return.

We haven't yet found the formula for instant experience and each of us has accumulated experience the hard (and sometimes painful) way. Many of us have been pulled out of a tight spot before it closed in around us by another, more savvy pilot—an IP, the guy in Mobile, a flight lead.

The Mobile Controller, when he's on his toes, doing his job, will quickly spot a bad pattern. If he knows the pilot, he will evaluate the pattern in terms of that pilot's experience and ability. In any case, he will take action before it's too late. A warning, even to an old head, before a go-around is mandatory, can save the day. Certainly, when Mobile knows the pilot is new or inexperienced, he shouldn't hesitate to issue a go-around before the pattern has deteriorated beyond safe recovery.

But there's another angle to this experience thing, and that's recognition. Regardless of your flying time, age, rank or position — as long as you fly, you will continue to encounter situations you have not experienced before. The important thing is to acknowledge that they are new — you haven't been there before. Then proceed with the amount of caution dictated by your knowledge of the situation, its newness or strangeness.

You *can* get there when you haven't been there before. But you'll be assured of a safe arrival if you go at it with deliberate caution the first few times. ★

"ARE YOU READY?"

In an article titled "Are You Ready" in the November 1969 issue we made some statements about withdrawal distances from ordnance engulfed in flames as they apply to local base rescue (LBR) helicopters. Our statements, on page 19 of that issue, require some amplification.

We paraphrased an aircraft accident report, saying that withdrawal distances for ground fire fighting equipment are based on blast effect and no data are available for helicopter units to relate these distances to the effects of shrapnel or debris, which caused the accident we were describing. In that one, the entire rotor system of the helicopter was severed by flying debris. However, blast or overpressure from the explosion could have caused disabling damage as readily as the debris.

Information available to us at this time indicates that the withdrawal distances for ground fire fighting equipment, contained in T.O. 11A-1-55, are valid in any direction and apply to airborne helicopters as well, although the T.O. does not specifically mention them.

The accident board recommended that a study be completed to develop standard procedures for HH-43 coverage of accidents involving explosive ordnance. This study is now underway.



CABBAGE PATCH. It has happened again, with the expected results. An O-2 was being fueled but there wasn't quite enough gasoline in the bladder to finish the job. So the hose was attached to another bladder that had been delivered to the refueling spot by forklift and the tanks were topped with an additional 10 to 15 gallons.

Apparently the mission was flown with no problems and the aircraft returned and was refueled. The next day engine failure caused the pilot to make a forced landing in a cabbage patch. The bird was pretty badly dinged and the crew was injured. When the investigators dug into the cause they found that the second bladder contained JP-4. Apparently not enough was introduced during the previous day's fueling and the aircraft engine operated okay. But when it was refueled with more JP-4, that did it.

Such mistakes have cost us lives and aircraft, and will continue to do so until there is some foolproof method to positively prevent them. Until then, people who fuel aircraft must be constantly aware that this possibility exists. Supervisors should make this a frequent item of discussion, and aircrews would do well to make sure they have the proper fuel aboard.

GROUND EGRESS PRACTICE. When one performs a task day after day it seems that it becomes automatic. Such is not always the case when the task is rushed, especially under great stress. This is why frequent practice of ground egress is necessary. Getting out of the bird under normal circumstances is no problem. But in an accident, especially with fire, rapid egress may mean the difference between life and death. The examples to follow reinforce the wisdom of frequent ground egress practice.

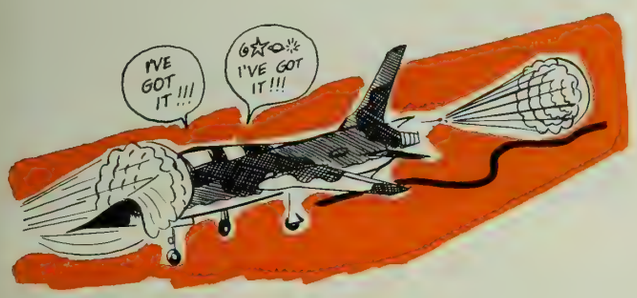
When an F-105 went off the runway during takeoff the gear collapsed and the bird stopped, on fire, about 125 feet off the pavement. The pilot jettisoned the canopy, released the lap belt, parachute chest strap and left leg strap, and tried to stand up. But he forgot



to release the right parachute leg strap and was pulled back into his seat. He then released the strap, but again he forgot--he had not disconnected the oxygen hose from the CRU-60P connector. He pulled it loose and climbed out over the canopy rail.

The other accident involved the pilot of an F-4 making a formation landing. He also found himself off the runway in a burning aircraft with a collapsed nose gear. When the crew scrambled out of the airplane the AC forgot to release the parachute riser-shoulder harness fittings and the survival kit prior to attempting egress. The right sticker clip did not release so he then manually attempted to disconnect the canopy releases and pulled the survival kit handle. As he climbed over the left side, his parachute remained under the left canopy rail attached to the survival kit. There he hung, suspended by his parachute risers, over the left intake in the area which was burning. Firemen came to the rescue and cut him loose before he got singed.

Have *YOU* practiced lately?



SPEAK THE SAME LANGUAGE. There's an old, tired story about the IP who was back-seating it around the busy traffic pattern at a training base: On the go from a touch-and-go, he decided to shoot the next pattern himself to show the student some fine points. Trouble was, he inadvertently punched the mike button when he said, "I've got the airplane." Immediately, the story goes, every student in the pattern released the controls of his aircraft. It took several minutes to sort out the confusion.

That story has been around for a lot longer than I have, and it is usually met with a "you've gotta be kidding" reaction. But check the incident below . . . they still happen!

On landing roll, in a tandem-seat fighter, the student in the front seat found he couldn't pull out the drag chute handle. Getting the gist of the mutterings in the front seat, the IP obligingly offered, "I'll get it," and pulled *his* drag chute handle. The IP then busied himself adjusting his mirror so he could check that the drag bag had deployed. Meanwhile, the student, seeing the bird weathervane after the chute deployed, assumed the IP had taken control of the airplane.

Before they got this one sorted out they:

- Overtook Lead, who had landed in front of them,
- Engaged in a shouting contest about who had control of the bird,
- Each took turns jabbing at the brakes,
- Finally veered away from the other airplane, and
- Taxied to the ramp with Lead's drag chute hanging forlornly from their pitot boom.

There's a lesson here somewhere, about agreeing between the two of you exactly what you're going to say when you take control of the airplane and then both sticking to it.



HELP WANTED. In the reorganization to consolidate three major USAF safety publications in a single monthly magazine, we thought we had all the wrinkles ironed out, all the positions filled with hard-working, experienced people. Then one of them went and got himself promoted out of the job. So we're out beating the bushes.

Starting in April-May '70, the desk of the Assistant Editor will be vacant. We're looking for a major (or captain) to sit at it . . . sometimes. Much of the time he will be chasing around the building (and around the Air Force at large) tracking down material for magazine articles. He will be writing articles, short briefs and accident reviews, as well as editing and re-writing material contributed by others.

He should be a graduate of the USC Flight Safety Officer's course and have experience at wing level or higher in Safety, Operations or Maintenance. Of course, a completed SEA tour is a must. Flying experience in more than one Command or flying mission is desirable, but not required. A degree in engineering or education would help a lot, too.

We're not looking for an accomplished journalist as much as someone with reasonably broad Air Force flying experience who wants to tackle a challenging, sometimes frustrating and always changing and different job.

If you're interested, or know of someone who fits the bill, please write: Directorate of Aerospace Safety (AFIAS-E1), Norton AFB, CA 92409; or call Autovon 876-2633. ★

A BIT OF FLAP



— a pilot learns that communication is more than telephones.

"Well, it's about time!" the Ops Officer roared as Tom walked into the building Monday morning. "I hardly had a chance to get through the door this morning when Colonel Martin was on the phone. He wanted to know what the big flap was between you and the command post Friday night."

Captain Tom Winters stopped momentarily in his tracks. Collecting his thoughts rapidly, his mind racing over the events of the past weekend, he moved toward the counter to face the Ops Officer. He knew there was no point trying to soft-pedal this one. Best to face the facts.

"Yes sir—ah, bit of a flap on the phone." Tom couldn't decide where to start his narrative. "I still think I was doing the right thing. We'd pushed pretty hard all day, and with no pressurization, and that icing, I was bushed and I knew the rest of the crew was too. When they wanted us to continue beyond normal crew duty time just to get the bird back home, I told them I was calling crew rest."

"That's not exactly the way I heard it from the DO on the phone just now, Tom. What's all this about RON-ing because of icing enroute . . . and then arguing about a crew-duty extension when they gave it to you?" He paused, then went on. "But I'm sure there are two sides to this thing. Service your coffee mug and come in the office. We'd better sort this out before it gets to the Old Man—we can, can't we?"

"Oh sure, sir," Tom saw this was his opportunity to be heard. "I guess all the DO has heard is what that major in the command post told him. And that guy just didn't understand that he couldn't know the condition of my crew from his soft seat a few hundred miles away."

"Okay, Tom," the Ops Officer was seated at his desk with his pencil ready. He was going to the DO's office armed with whatever facts Tom could give him. "Give it to me so I can understand your decision. Start as far back as you need to, but give me the details of this exchange with the command post controller."

"Well, you know Friday was the last day of this exercise with the Army. We were on duty at 0450, scheduled for two drop missions

and then the run back here. The local missions went smoothly—as well as you could expect. We were unpressurized and had no cooling on the flight deck. But that wasn't a major problem, certainly, for what we had planned for the day.

"Then, when I landed after the second drop, I got a call from our command post saying we were to divert on the way home to pick up some cargo and passengers. I pressed off and didn't have any difficulty until we approached the divert base. There was pretty sour weather in the area—icing, drizzle—but after flailing around with Approach Control for a while, I got to ILS final and landed. By the time I parked and located the load, it was 1650. We had two hours left of our normal 14-hour crew duty."

The Ops Officer was scribbling on his pad, nodding as Tom went on.

"I guess I made up my mind to RON while I was talking to the weather man. He gave me the same kind of weather all the way home. Freezing precip, icing, all that. And without pressurization, I would have to stay at low altitude, with passengers aboard.

"We had figured about 1 plus 50 to get home. Adding that to the time it would take to load the cargo and secure it, I couldn't make it in normal crew duty time. That's about what I told the command post. The guy there acted like he sure wanted me to overfly the fourteen hours—like, just a little bit, you know. And I told him I didn't think I should.

"He finally said, 'Okay, if you insist on it, Ill give you a two-hour crew duty extension.' Something like that. I guess his tone of voice carried all the impact, but I made up my mind then and there I wouldn't let him talk me into something I really didn't think we should do."

"Okay, that's fine." The Ops Officer was still nodding in agreement. "Its your decision and you made it."

"So I told him I was RON-ing, and we'd bring the bird back Saturday morning. That was when he told me to hold the line, he was going to call the DO. I guess he didn't exactly say he was directing me to come back right away, but the whole exchange felt like he was really putting the pressure on.

"When he came back on the line, he said to go ahead and RON — but to take minimum ground time and be off no later than 0500 in the morning. 'It's 1700 now,' he said. 'That gives you 12

It was a busy day supporting an Army exercise.





"We were on duty at 0450 . . . two drop missions . . ."

hours—which should be all you need.'

"I didn't argue. Maybe I should have. Twelve hours would have been okay, but considering the time it would take to taxi the bird to another parking spot, tie down the load . . . and then the business about getting transport to town and a motel. We'd been told there were no quarters available on base.

"The guy in the command post was right on the edge of getting nasty—and I'd had enough of him. So I rogered the 0500 takeoff and hung up. I think he may have still been saying something, but I had my instructions—all I needed from him, anyway." Tom was showing some of the emotion he had felt Friday as he relived the phone conversation.

"The guys on the crew were relieved when I told them we were staying for the night. But when I told them about the takeoff time, I saw their smiles disappear. We went back to the aircraft, taxied to the other side, checked load security so we would be ready to leave in the morning.

"When we got to Billeting, they said they couldn't give us a vehicle to the motel until two other transient crews were ready to go. We waited another 40 minutes or so. Then it took half an hour to get into town. At eight-fifteen I was back in my room after eating in my goat skin—and I had about seven hours until get-up for the 0500 go.

"Walters and Hawkins had to go to another motel with the rest of the NCOs. They told me they were unable to get to bed until after nine o'clock, and had to get up earlier than we did because the bus was picking them up first. That's what generated the OHRs they turned in when we got back."

Tom stopped talking and raised his almost-forgotten coffee mug. The Ops Officer finished writing and looked across the desk for a long, silent minute.

"I thought you were on the right track there when you turned down the two-hour extension, Tom," he started slowly. "But then only 12 hours ground time. . . .

"I guess I can see how it happened, though. You couldn't foresee all the delays. And you didn't want to push the command post any farther after they gave you the RON you needed."

The Ops Officer got up and reached for his jacket and hat. The interview was over. Tom went back to the coffee pot to refill. Nothing to do but wait for reaction from the DO.

Colonel Martin watched the Ops Officer and the major from the command post as each one told his version of the story. It didn't take long for him to see that as each went through his narrative, the other was frequently surprised as the facts came out. The colonel gave them both a chance to finish. Finally they were both silent, expectant, a hint of hostility bridging the distance between their chairs.

"It's obvious to me," he started slowly, "but I wonder if either of you caught what I caught as you went through your two very different versions of what happened. You," he turned to the major, "and your captain," he nodded to the Ops Officer, "weren't communicating!"

The colonel leaned back and let that soak in for a minute. "There are a number of points in each story, as you told them here, that obviously you didn't tell each other on the phone Friday night. For instance," he faced the major again, "it sounds to me like Captain Winters never knew he was operating on an extended crew duty day or why he was diverted. He was diverted to take part in that flood relief operation in Ohio and we had authorized a 16-hour crew duty day. He thought he was on a 14-hour day. Obviously, he wasn't told at the time he was diverted, and didn't understand the urgency of his mission."

The major started to speak, but he didn't.

"But that's not all." The DO turned enough to fix his gaze on the Ops Officer. "From what you and I both heard Major Wells say just now, do you think Winters fully explained all of his reasons for insisting on the RON? How about the unpressurized cabin? I don't think Wells here knew they'd have to fly back through that icing at low altitude with passengers. What about the inoperative flight deck air conditioner and its fatigue effect on the crew during the day? And when we decided on 12 hours' ground time, we didn't know the quarters on base were full, or the extent of the delays in getting to and from the motel.

"Of course, no one could forecast all of those delays, but we would have better understood Winters' situation if he had clued us in on all the problems."

Both the major and the Ops Officer appeared about to speak, but the colonel cut them off. "A little more communication, and more effort to understand the problems of the guy on the other end of the horn, could have stopped this long before it was big enough for me to get involved.

"Sure, I realize that once the atmosphere of friction was established, there was little likelihood that Winters could get through to us with a complaint about delay getting to and from the motel. But that was the result of non-communication right from the start.

"Okay," the colonel waved both of them out of the room with the back of his hand, "you two get out of here and let me write something for the CIF about people talking to each other. Or people not talking to each other. Or something." ★



Pilot Factor

About 35 per cent of the Air Force's major aircraft accidents bear the label *pilot factor.*

This seems to be a fairly high percentage, although we aren't aware of any optimum figure that may have been determined. So for want of anything better, we must assume that of all the major aircraft accidents that occur, approximately one-third of them will be laid on the pilot. Since we're stuck with that figure, distasteful as it may be to aviators, let's look at another side of a many-faceted subject. Some examples will perhaps best serve to get started.

• F-4E — Shortly after the pilot made a left pitch for landing, the aircraft rolled faster than normal and continued to roll after the ailerons were neutralized. The pilot rolled around to straight and level, disengaged the stab aug, retrimmed the rudder and was able to make a straight-in without further trouble. The problem was a malfunctioning yaw amplifier that deflected the rudder five degrees left.

• F-104A —During cruise at FL 310, .85-.87 Mach, the aircraft suddenly decelerated and assumed a nose-down attitude. Engine instruments were checked in the green, flaps, speed brakes and landing gear were in normal position. The pilot applied military power, nose up trim and jettisoned the drag chute. Deceleration ceased immediately but the nose-up trim now caused pitchup which with the existing airspeed actuated the stick shaker. The pilot went to takeoff flaps to increase the stall margin and recovered. All this occurred within about 10 seconds and 5000 feet of altitude was lost.

A precautionary landing was made at a nearby base and the bird checked over. Apparently the drag chute was improperly installed by personnel who were not familiar with the F-104 drag chute installation. Here again a pilot was faced with a serious situation that required a quick reaction and thorough knowledge of his aircraft. We can only speculate on the outcome had this event occurred during takeoff or in the landing pattern.

• T-33 — Toward the end of a flight the pilot noted a left stick restriction with aileron boost on. Right stick travel was okay. He turned off the aileron boost and lost all left stick travel. Boost on, he still had a little bit. He slowed the bird at altitude to check control and made a 12 nautical mile straight-in. During flare he had the left wing down a bit for crosswind when complete left stick travel was lost. Nevertheless, this pilot made a successful landing. The aileron boost bypass valve had failed.

Each of these was reported not as an accident but as an incident.

Almost without exception Air Force pilots are highly skilled, confident and extremely proud. In a profession that demands the best, they feel they are the best. Part of their pride comes from the knowledge that they have mastered the many skills required to qualify for the position they hold.

Most recognize the possibility that they may someday find themselves in a situation with which they cannot cope. They are also realistic enough to realize that there are occasions wherein the pilot is a contributor to the situation, and these situations occasionally become accidents with the primary cause labeled Pilot Factor.

But pilots also prevent accidents. What if we applied a factor to accidents *prevented?* What do you suppose the pilot factor percentage would be?

Each of the examples given could very well have been an accident except for the actions of the pilot. So wouldn't it be accurate to say that more often than not we can take pride in those words, Pilot Factor? ★

OLD FIGHTER PLANES NEVER DIE

Lt Col Wayne H. Hemm
Directorate of Aerospace Safety

A fighter plane, due to its mission, must endure more stresses and strains than any other type of aircraft. You wouldn't think many pilots could spend most of their Air Force careers associated with one type fighter plane as they can with something like the old Gooney bird. Well, the possibility is becoming more of a reality. The F-100 Super Sabre has been operational since 1954 and is still going strong as one of the major workhorses in SEA.

Granted, due to its age, the F-100 has developed some creaks and groans both internal and external. But it is being given a new life. With modifications that are in progress, and others programmed, it looks like the Super Sabre will never die, but just slowly fade away.

A brief history of the fighter that introduced the Century series reads like this: The YF-100 made its first flights on 25 May 1953 and set a new record by exceeding Mach 1 in level flight. The first F-100A was delivered to the Air Force on 26 October 1953. The last F-100F was delivered 30 September 1959, completing the delivery of 2288 F-100A, C, D and F airplanes. F-100 units



are active in TAC, USAFE, PACAF, ADC, ANG, and in the Nationalist Chinese, Danish, French, and Turkish Air Forces.

Now let's take a look at some of the modifications being accomplished and programmed on the F-100s.

In September 1965, an Airplane Structural Integrity Program (ASIP) was undertaken on the F-100 to determine what was required to increase its service life. Comprehensive fatigue load gathering programs were developed to collect flight load data, ground load data, and in-service failure data. Eventually, a full scale fatigue test of wings, fuselage, vertical tail and landing gear was undertaken (and is still underway) on unmodified and modified components. Early tests on unmodified components indicated incipient failures in certain components. Before the tests were completed, catastrophic in-flight failures of these components resulted in the loss of three F-100s and two pilots.

Due to the ASIP, an immediate interim fleet modification was completed in January 1968. Other modifications underway as a result of the F-100 ASIP are: (1) replacement of the wing center section lower dual skin which will delete the present 4 G restriction on the aircraft; (2) replacement of the wing outer panel lower skin which will add active-life airframe hours to the bird; (3) installation of a reinforcing doubler on the fuselage about halfway between the canopy and vertical stabilizer.

Engine and engine-associated mishaps have been the leading single cause factor of accidents in the F-100. Recently, metal fatigue has caused failures of the tenth stage vane and shroud assembly in the J57-21 engine. To correct this problem, a force generation program is being accomplished to replace tenth stage vane and shroud assem-

Still going strong! Move over, Gooney Bird, another old timer is joining your act.



This F-100 wears camouflage suit. Super Sabres carry their share of the load in Southeast Asia.

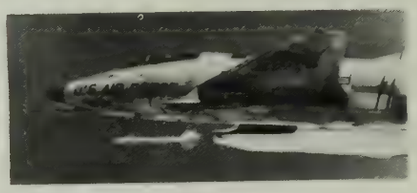






Thunderbirds flew F-100s for years. Just recently switched to newer F-4s.

F-100 and AIM-9 in action.





Buddy refueling. F-100 proved to be versatile with many capabilities.

blies in all J57 engines. A complete rehab of the J57 engine has been proposed under a project called "PACER RAKE." If implemented, it will greatly increase the life and reliability of the engine.

Many F-100s have been lost due to flight control disconnects. Improper installation of nuts on bolts has resulted in the bolt falling out of flight control linkages and the pilot being forced to eject. Remedial action of changes from one type of nut to another, fleet inspections, and improved inspection procedures did not correct the problem. Finally, action has been taken to minimize, if not eliminate, this problem by installation of self-retaining bolts in the rudder-horizontal stabilizer system, ailerons, and flaps. These bolts will not fall out of the flight control linkages even if the nut does come off.

Tests are being conducted for possible modifications to the F-100 egress system. These would incorporate installation of a single motion ejection system, a dart seat stabilization seat-man separation system and a Stencel forced-deployed parachute.

We in Flight Safety would like to see *both* the aircraft *and* the pilots reach retirement age in good condition. ★



As test bed, F-100 was launched with rocket tied to its tail.

Dropping bombs — just another weapons delivery for this old bird that is getting a new lease on life.



YOUR NEW FLYING SUIT



Lt Col Robert Bonner
Directorate of Aerospace Safety

Next time you are issued a flying suit expect something new. It will look different because it is different and there are a few things you should know about it.

The main feature can't be seen but it's very important. This suit, the CWU-27T, is made of *Nomex* and is more fire-retardant than the K-2B you are now wearing. It won't melt and about 150°F more heat is needed before it will char.

When one reviews injuries received in ground impact *survivable* accidents, it becomes apparent that fire causes more injury, disability, disfigurement, and death than any other single agent. Considerable research has been devoted to producing a fire-retardant suit for Air Force aircrews which is comfortable and still will provide protection against fire. The result is the *Nomex* suit. The following cases illustrate the need for such a suit.

Case 1: As an F-4D aircraft approached the touchdown point, it began to roll to the right. The pilot was unable to correct the roll and a go-around was unsuccessful. The right wingtip contacted the runway and the aircraft, in a nose-down attitude, veered to the right and departed the runway. The copilot ejected in a left bank ten feet above the ground, at an airspeed of 140 knots. He ejected through a spray of fuel and his clothing and equipment were soaked. Fire erupted and his coveralls burned during the ejection sequence. The K-2B flying coveralls and gloves provided no protection from the fire. He succumbed 19 days after the accident from third degree burns to 90 per cent of his body. Although the ejection system worked perfectly, the individual died from burns. Had the *Nomex* suit been available, this death would have been prevented, since *Nomex* doesn't burn and does not transmit heat below 900° F.

Case 2: During takeoff roll, the aircraft commander of a B-52D elected to abort the takeoff shortly after S-1. He was unable to stop the aircraft on the runway. As it crossed the perimeter road and drainage ditch, aircraft breakup started and fire ensued. The pilot



New CWU-27T **Nomex** flying suit designed to provide extra protection to crew in case of fire. It is now in supply as a replacement item.



This suit is more form-fitting than the K-2B which it replaces. It won't be as comfortable in hot weather, but that's a trade-off for increased fire protection.

ordered the crew to abandon the aircraft. He attempted to open his hatch unsuccessfully. Consequently, he escaped out the copilot's hatch. Flames were in the area so he went over the nose and down the left side. He received second degree burns of the left wrist. The crew chief was seated in the IP's seat. He also went out the copilot's escape hatch but evidently jumped directly into the fire. His flight suit ignited and he had to be forcibly restrained in order to extinguish the flames. He died 48 hours later from complications of the second and third degree burns over 82 per cent of his body. The EWO had no difficulty exiting the aircraft through his own escape hatch. While he was escaping, a fuel explosion occurred and engulfed him in flames. He died 24 hours later from second and third degree burns received over 92 per cent of his body. These two fatalities might have been prevented if fire-retardant flight suits had been available, since a *Nomex* suit would not have ignited.

The two cases mentioned above



Sage green in color, suit has stood up well in test washings.

clearly demonstrate the need for a fire-resistant suit. There are numerous other examples in accident files to support this idea.

Now let's look at a case where an individual had a fire-retardant suit. As a TF-101F was taking off, oscillation developed shortly after the afterburners were ignited and the aircraft yawed right and left. The pilot initiated abort procedures. The nose gear sheared, the left main gear collapsed when the aircraft left the runway and fuel from a ruptured drop tank ignited and enveloped the aircraft in flames. The pilot jettisoned the canopy and exited over the right side. When he got outside the fire area, he went to the assistance of the copilot who also was out of the aircraft. The pilot received first and second degree burns (not considered serious) in the face, neck and wrist areas. He was wearing a chemically treated fire-resistant flight suit which he had obtained from the Navy. The lightweight flight jacket was burned and portions melted to the fire-resistant suit. The copilot, who was wearing the standard cotton K-2B flying coveralls, received fatal second and third degree burns over 66 per cent of his body.

Discussion with the medical personnel who took care of both these pilots made one point quite clear. The wearing of the fire-resistant flight suit by the pilot indeed saved his life. His burns were minimal and will not require any extensive hospitalization. Conversations with burn team specialists at the Brooke Army Medical Burn Center clearly demonstrate that individuals wearing fire-resistant suits have much less severe burns and are more likely to be able to continue an active flying career.

Naval aviators are sold on fire-resistant suits. Since they have worn them, there are several cases where individuals escaped from burning aircraft with minimal burn injuries, where before, in similar circumstances, the individual probably would have been fatally burned.

This doesn't mean, however, that you should dawdle in a fire. The *Nomex* suit is *not* a fire-fighting costume. It is not fireproof, but it is fire resistant and *will* give you additional protection.

As for some other aspects:

The *Nomex* suit was not, like the K-2B, designed to be worn over a Class A uniform. It is more form fitting.

It will probably not be quite as comfortable, primarily because it does not dissipate moisture as effectively as the cotton material in the K-2B.

The suit is washable and tests indicate no problems up to 35 or so washings. It is sage green in color—like the K-2B—so expect some fading with long usage.

At present the suit is intended for year-round wear and there is no plan for a winter version. However, the suit was designed to be worn over the CWU-9 insulated underwear during cold weather.

Deliveries were scheduled to begin in late December with sustained supply expected by 1 May 1970. Procurement of the K-2B has been discontinued and the new suit will be issued on a replacement basis. ★

AEROBITS



FIVE MINUTES IS A LONG TIME . . . when you're preparing to bail out of an airplane. Few aircrew members are afforded that kind of luxury when they have to abandon a stricken bird. Most make their final preparations in a small fraction of that time.

A multi-engine aircraft crew who recently bailed out suspected they would have to jump at least five minutes before they actually left their bird. And with all that none of them took the time to don his flying jacket or gloves. None of them attempted to fasten a survival kit to his harness although kits were available in the airplane.

In addition:

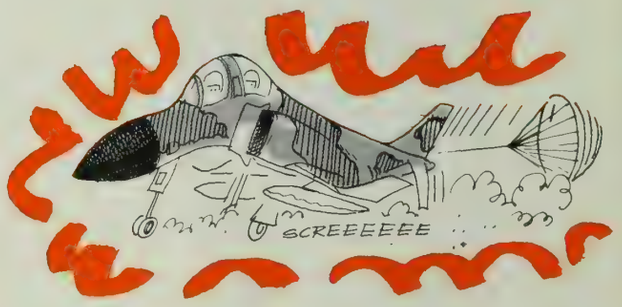
- One crewmember didn't bother to put on his helmet.
- One didn't fasten his chin strap and lost his helmet immediately after he left the airplane.
- Another who failed to fasten his chin strap managed to retain his helmet because his oxygen mask kept his helmet on.

Fortunately the weather was good, winds were light and the crew landed close to civilization. The two without helmets had their landings softened by trees. None of the four was involved in an extended survival situation. They were all rescued with only superficial injuries.

You may not be so lucky! Your life support equipment does you little good if you don't wear it properly —or if you leave it behind.

And this time of year, it's mighty important!

(Adapted from a SAC bulletin)



ABORT EARLY—AVOID THE CRASH. In a recent ten-month period the Air Force wrote off half-a-dozen flying machines which crashed on take off without doing any flying. The investigations revealed that in nearly every case there was time for the pilot to abort and save the aircraft.

Why didn't they? Maybe because they weren't spring-loaded to the ready position—ready to take positive, planned action. There's a batch of difference between merely memorizing emergency procedures for the Stan/Eval exam and knowing them so well they become second nature. There's very little time for decision-making when you're driving a high speed tricycle. And there's no room at all for guesses.

Your abort actions must be timely and they've got to be right the first time, every time! The margin for error is so small you simply can't afford to bet your life on it —so don't! Be prepared on every takeoff. It's the most critical phase of the flight.

P.S. Fighter pilots, there are two controls in the

cockpit which you should be able to put your finger on like RIGHT NOW—without looking! One lowers the cable catcher. The other operates the instant weight reduction and garbage disposal system.

Major Robert Picht
Directorate of Aerospace Safety



PILOT-TO-FORECASTER SERVICE (PFSV). An event that occurred at Maxwell recently went something like this: "Hey Sarge, how is the weather at Columbus and what does it look like in about three hours?"

"Fine, sir, weather at Columbus AFB is three thousand scattered, ceiling five thousand, vsby above six miles."

"NO! NO! I mean Columbus, *Ohio*."

Fortunately, other than an aggravated forecaster and an upset pilot, there were no other problems.

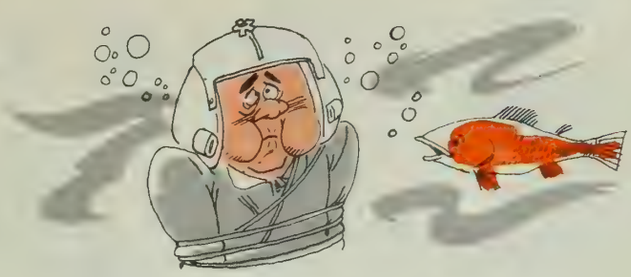
However, let's suppose this request had been received via Pilot-To-Forecaster radio and the pilot's destination had been Columbus, *Ohio*. If the Columbus AFB weather had been given in place of Columbus, Ohio weather, the pilot would have been rather surprised to find three hundred overcast and vsby one mile with rain showers at his time of arrival.

Here are some of the stations that sound similar, particularly over the radio: England and Eglin, Stewart and Sewart, and two of the worst offenders—Robins and Dobbins. A simple solution to Robins and Dobbins is to always say "Warner Robins" instead of just "Robins" alone. Due to the acoustics in most weather shops, radio reception will play tricks even though the stations have dissimilar names. For example, McDill and Maxwell, Barksdale and Maxwell. Eglin even sounds like Maxwell at times. Interruptions, cutouts, and ground station transmissions also play havoc with reception.

Fortunately, the solution to the problem is simple: Speak slowly, enunciate clearly, and if in doubt about being understood, amplify. This will help the forecaster to provide you with better service.

SSgt Billy D. Longgrear
Maxwell & Gunter's Safety Bulletin

(Can you think of any confusion-producing names in your area?—Ed.)

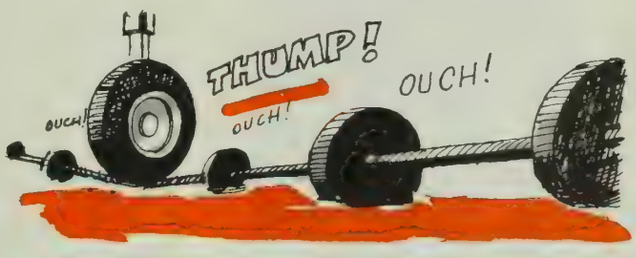


A PARACHUTE CAN SAVE YOU—OR KILL YOU! During an overwater ejection from a crippled (Navy) F-4, the RIO allowed himself to be distracted by a possible leak in his life preserver at the expense of giving thought to ridding himself of his parachute. Convinced that his life preserver had a leak after entering the water, he decided to immediately find his raft before he took the time to release his Koch fittings. Just before he reached the raft in the seat pan, a large wave hit and drove him underwater. When he surfaced he was entangled in the parachute shroud lines.

He released his Koch fittings at that time, but found one leg entangled in the shroud lines that were pulling him under. After a bit of a struggle, he found the knife from his survival vest and cut himself clear of both shroud lines and raft.

It takes one like this to remind us how deadly a water-filled praachute can be. A perfect ejection can be of little value if you are then drowned by the parachute that just saved your life.

(Adapted from USN *Crossfeed*)



ARRESTING GEAR CABLE SUPPORTS. A number of airfields within PACAF are now equipped with polyurethane plastic rails for supporting aircraft arresting gear cables. These rail-type supports are permanently attached to the runway and are in position regardless of whether the cable is extended across the runway.

The polyurethane supports are capable of withstanding high speed roll-overs and will not cause damage to aircraft or tires. However, like the rubber donut, they can and most probably will be damaged beyond repair if touchdown occurs directly on the supports or on the arresting cable. ★

Maj David L. Elliott
Directorate of Aerospace Safety

MAIL CALL



FOD

With reference to the FOD article in the August 69 issue, I'd appreciate further information relative to the words: "An engine can pick up objects through vortex generation. McDonnell Douglas Corporation has conducted tests of this phenomenon. They have shown that a jet engine can pick up relatively large objects — bolts, marbles, pieces of sheet metal and small rocks."

Through the years, I have been led to believe that just the opposite is true, i.e., that a jet engine generally will not pick up such objects unless said objects are already in motion from prop or jet wash, winds, etc. It seems I recall movies of nuts, bolts, grass, cloth, etc., placed on the ramp in front of a jet engine intake with no significant disturbance resulting from jet intake generated vortices. (Are vortices actually generated in front of jet engine intakes or do we have just a general air movement? Has a smoke film been made?)

It seems possible, however, that at high power settings and with engine intake relatively close to the ground, certain types of material, not already airborne, may be disturbed enough to be sucked into jet engine intakes. Can you identify any film that may show this?

George E. Kammerer
SMAMA (SMITF)
McClellan AFB, Calif.

We suggest an Air Force film SFP 1263, "The Case of the Million Dollar Pliers." Also see the Sep 1962 and Feb 1965 issues of Aerospace Safety. Articles on the subject appear in both of them.

"DON'T KILL THE CROW," OCT. 69 ASM

The author of subject article italicized "in normal sequence with other traffic" which is the fly in the ointment because it puts the monkey on the pilot's back to assess the traffic situation when he's hardly in a position to do so.

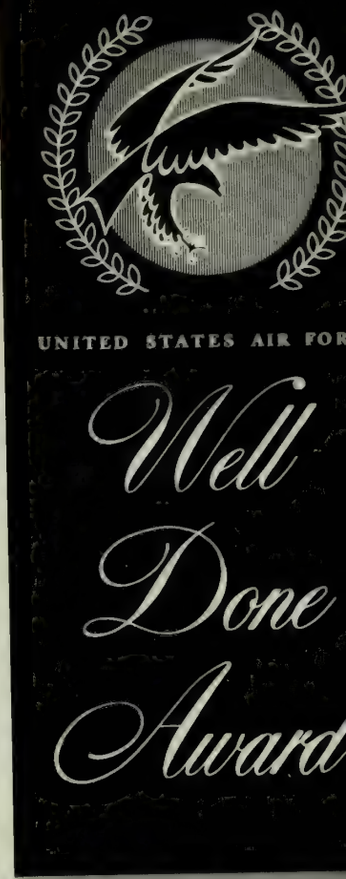
The term "minimum fuel" may be meaningful, for example, if a pilot is VFR and number two for landing. But, if he's IFR and about to transition to approach control, how in the world can he assess the traffic ahead of him and the fuel required to get him on the ground?

I would suggest that a term "marginal fuel" be used to clue controllers to inquire what is meant in flying time at, say 5000 feet, and the term "minimum fuel" to denote an emergency situation. Then the crow would be a crow, and a blackbird an entirely different species.

Charles D. Kilpatrick
2578 Air Base Group
Ellington AFB, Texas

It sounds to me as though you're proposing a new name for the same bird, and we're not getting tangled up with another species after all. "Minimum fuel" is supposed to trigger controllers to inquire . . . if they have something other than a no-delay approach in mind for you. And "emergency fuel" means emergency, which seems a lot more direct and meaningful to me than any other word I can think of. Now, about "marginal fuel." Marginal for what . . .?? Ed. ★

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performance during

a hazardous situation

and for a

significant contribution

to the

United States Air Force

Accident Prevention

Program.



Major
Raymond L. Norman

4 Tactical Reconnaissance Squadron, Bergstrom AFB, Texas

On 13 March 1969, Major Norman was piloting an RF-4C on a low-altitude training mission with a student navigator in the rear seat. While in a level 45-degree-bank turn at 1200 feet and 420 ktas, the aircraft struck a flight of ducks. One duck struck the right quarter panel of the windscreen and continued into the cockpit, glanced off the instrument panel and struck Major Norman on the head and right shoulder. Although stunned and blinded by debris from the bird and windshield that had blown under his visor, Major Norman realized he was at a high angle of bank at very low altitude. Due to high wind noise, communication with the navigator and ground control was extremely marginal.

The birdstrike also rendered the aircraft warning lights inoperative and caused the "Fuel Low Level" light to illuminate. Major Norman correctly analyzed this warning as erroneous and dumped fuel to lighten the aircraft for an immediate landing. By now, he had regained partial vision in both eyes. By shouting into the microphone, he advised Bergstrom tower that he had an emergency and was landing immediately. Although suffering extreme pain in his right arm and severe burning in his eyes, Major Norman safely landed his aircraft. WELL DONE! ★



Captain
Michael P. C. Carns

469 Tactical Fighter Squadron, APO San Francisco 96288

While flying a night strike mission in an F-4E, Captain Carns was unable to release six 500-pound bombs loaded on the right outboard station. Since the hung bombs exceeded the asymmetrical load limit for landing, Captain Carns obtained additional fuel and proceeded to the jettison range where he made two additional unsuccessful attempts to jettison the bombs and the Multiple Ejector Racks. Then he elected to land with the asymmetrical load condition.

Captain Carns flew the F-4E to a smooth touchdown on the 9000-foot runway and subsequently deployed the drag chute. Prior to initiating braking, he noticed a considerable shower of sparks in front of the aircraft's right wing. He immediately determined that both the bombs and the MER had separated and were moving down the runway beneath the aircraft. Captain Carns steered the aircraft to the left side of the runway and selected afterburner on both engines, but made no attempt to get airborne since there was a good possibility that the right wing, flaps, and aileron might have received damage from the skipping bombs and the MER. At approximately the 5000-foot mark, the pilot in the rear seat informed him that the bomb forward of the wing had finally left the right side of the runway. Captain Carns then retarded the throttles to idle, lowered the tail hook, and steered for the center of the BAK-12 barrier and made a successful engagment. By exercising outstanding judgment and ability in the face of multiple hazards, Captain Carns safely recovered a combat aircraft under the most uncommon of circumstances. WELL DONE! ★

The Name Is The Game!!!



HERE IS YOUR CHANCE

?

name the new Air Force Safety Magazine

Beginning with the March 1970 issue, Aerospace Safety, Aerospace Maintenance Safety, and the USAF Nuclear Safety magazines will be consolidated in a single, comprehensive monthly accident-prevention publication. We want YOUR suggestions for a name for the new magazine. See page 1 for details.

I suggest the title of the new magazine combining Aerospace Safety, Aerospace Maintenance Safety and USAF Nuclear Safety be _____

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LANDING SHORT - PAGE 2

Aerospace SAFETY

THE MAGAZINE DEVOTED TO YOUR INTERESTS IN FLIGHT

February 1970 AFRP 62-1 Volume 26 Number 2

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Maj Gen Edward M. Nichols, Jr. • Deputy Inspector General for Inspection and Safety, USAF
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As you probably know by now this is the last issue of **Aerospace Safety** devoted exclusively to air crews. Beginning next issue, this magazine will contain material oriented to both aircrew and maintenance personnel. The name will be the same, **Aerospace Safety** for three or four months, then after suggestions have been evaluated and a selection made, there will probably be a new title.

In this issue we had strictly the pilot in mind. Here's what there is and where to find it.

• "Landing Short" is not conducive to longevity of either the crew or the aircraft. Beginning on page 2 you'll find a rundown on the problem based on a study of more than 100 such accidents over a four and one-half year period. During the last few months of 1969 there were several more that were not included. You might be surprised to know that the majority of these occur during daylight VFR.

• "Maintain Airspeed and Control" is an axiom for pilots. The article, page 6, tells about two major accidents in which this most important axiom was not heeded.

• "Crowd Pleaser." Most pilots never put on an airshow. But some do and unfortunately, a few overdo it with fatal results. But this article, page 10, is not about airshows. It is about knowing how to get the best performance out of your airplane through an understanding of thrust and drag forces.

• "Into The Hillside," page 20, dramatically relates what happened when a pilot failed to use lost communications procedures.

AIR FORCE RESERVE

1969 Aircraft Accident Rate:

ZERO

Airlift-passengers, materiel

Search & Rescue

Overwater Mission

SEA Support

Tactical Airlift-
support of the Army

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LANDING SHORT

While on a precision approach, the C-119 descended through the glide slope and dropped slightly low at about a mile and a quarter from GCA touch down. As the aircraft descended even lower the pilot was told to "wave off" straight ahead if the runway was not in sight.

Moments later the airplane touched down in an apparently normal manner. Then the "normal" part was all over. The right gear collapsed, the aircraft started to roll and turn right, which was corrected by the pilot, then settled on the right aft fuselage and finally skidded to a stop 2000 feet from the threshold, 50 feet off the runway.

The initial touchdown was 80 feet short of the overrun and 880 feet short of the runway, on a sandy slope three to four feet below the level of the overrun. Right on cen-

terline, the aircraft struck a radar reflector which cut a 15-foot gash in the lower fuselage.

An isolated event? Hardly. This scene was repeated more than 100 times during the past four and one-half years. Practically every type of aircraft was involved at least once, and nearly every command got into the act. (The study from which these figures were taken covered only accidents, not incidents. What the significance is we don't know, but the F-100 came through scot-free).

While some of these accidents were the result of engine or other malfunctions that made a short landing inevitable, most of them were laid on the pilot—he misjudged, used poor technique, was distracted. The term "misjudged approach" or words to that effect appear frequently.

Overall we are not very consistent as the totals for the years included in the study illustrate. In 1965 there were 18 undershoot accidents. This jumped to 31 in '66 and you are probably saying, "ah, Vietnam!" Well, think again, because the number dropped to 11 in 1967, back up to 25 in '68, and 16 for the first nine months of 1969.

Fighters led the way in 1965 and 1966. Then the transports took over in '67 and '69 with a tie between the two in 1968. Figure 1 shows the totals for each type aircraft.

Obviously we don't have room here for an exhaustive analysis of these accidents. So to simplify matters, we are arbitrarily dividing them into two classifications: pilot factor and other. The latter should not be simply dismissed, but they are in the minority and consist of a number of random causes such as engine failure, electrical or fuel malfunction, etc. So we will address ourselves here to only those involving pilots.

Here are some very brief briefs selected from the aircraft types with the highest incidence:

F-102 ILS approach, right main gear hit strobe light. Pilot allowed aircraft to get too low.

F-102 Night ASR approach with VFR transition for landing. Aircraft hit 1130 feet short of the threshold and was destroyed. Pilot wore improper eye glasses (he'd broken his flying glasses and was wearing tinted bifocals); lack of night proficiency; airbase — earth overrun had settled and softened.

F-105 During go-around pilot was advised that he would be Nr 2 to land. Pilot stated minimum fuel and that he was going to bring it in. Base leg was close in and turn to final was tight with high sink, which continued to ground impact. Aircraft destroyed.

F-4 Aircraft was Nr 2 in a flight of two. Lead landed and Nr 2 started a straight-in TACAN approach after advising RAPCON of minimum fuel. Clearance to land issued at 4 NM. Aircraft flew into trees and crashed three NM short.

T-33 Turn to final approach on an SFO seemed normal and approach okay, then aircraft went low and hit a rock wall 1000 feet short and 30 feet below the runway. Both front seat pilot and IP apparently failed to recognize unsafe approach until too late. Misjudgment probably resulted from illusion caused by water and terrain features.

The factors in the cargo aircraft read similarly.

C-7 Routine approach until the aircraft hit short, right main gear struck runway lip and right wing separated. Pilot allowed aircraft to touchdown short and IP failed to correct. (Several of these read about the same.)

C-123 During flare pilot thought speed excessive and reduced power. Touchdown was 60 feet short and the right gear collapsed.

C-130 The flight was a pilot upgrading mission and the approach was to a 4300 foot strip over a 400 foot deep ravine. Turn to final was overshot and they went around. Again on final, the pilot tried to reduce descent with back stick and a high sink rate developed. Touchdown was short, right gear hit lip and separated. The aircraft left the runway and was severely damaged.

FIGURE 1

UNDERSHOOT ACCIDENTS

1965 - 1969 (8 months)

F-84	3	T-38	3	B-57	1
F-100	0	C-7	5	B-58	1
F-101	3	C-47	1	B-66	2
F-102	7	C-54	1	OV-10	1
F-104	2	C-97	1	O-1	7
F-105	8	C-118	1	O-2	0
F-106	1	C-121	2	U-2	1
F-4	10	C-123	7	U-6	1
F-111	1	C-124	1	UH-1	1
T-28	1	C-130	11	UH-3	2
T-33	10	C-135	1	UH-16	1
T-37	1	T-39	1	UH-21	1

LANDING SHORT

. . . . CONTINUED

While the predominant cause factor in these accidents was the pilot, this does not mean that we should point a finger at the jocks and holler "You goofed!" Many of the pilot factor accidents had contributing factors that must be examined if such accidents are to be prevented. For example:

- Facilities were involved in 20 accidents. Included were such deficiencies as no overrun, no approach lights, construction in progress, no runway lights, or only marginal or primitive lights, runway lips and soft dirt in the overrun, lack of or insufficient landing aids. These, of course, reflect the Southeast Asia environment and show up primarily in the figures for the C-7, C-123 and C-130 which were operating into many marginal airstrips.
- In 11 of these accidents training was in progress. Almost all of these were of the transition, check out, or in-country indoctrination type training, rather than student training. Several were clear cut cases of the AC or IP letting the pilot get in too deep before he took corrective action, which was then too late.
- Weather or weather associated phenomena appeared in 19 cases. This was in the form of low visibility during approaches, rain, wind, turbulence or downdrafts off the end of the runway due to terrain. Weather was not listed as the primary cause in any of these accidents, but was listed as contributing in that it aggravated the situation the pilot was coping with.

An accident is pure loss of manpower and equipment. But it may not be a total loss if the causes are determined and that knowledge applied to preventing others. From these landing-short accidents we should be able to profit.

One of the items that appeared with some frequency was that of the A/C or IP allowing the pilot to get into a situation from which recovery was impossible. This is a problem as old as aviation and involves the delicate instructor-student relationship. In a pure training situation the student is expected to make mistakes and the instructor is normally ready to take over early enough to prevent a disaster.

When both pilots are experienced and pure training, such as in an RTU, is not the case, the instructor or A/C may be more reluctant to take corrective action until the situation is really critical. Then it may be too late. Complacency may contribute, since the A/C may assume the pilot is capable of salvaging the situation.

At first glance it may seem obvious that the remedy, or at least a primary one, is alertness on the part of the pilot in command and aggressive action in taking over when necessary. But that is not the entire solution because we encounter situations in which both pilots were fooled, and that brings us to the next subject — airfiield environment and facilities.

There were several instances reported in which both the pilot in command and the trainee failed to perceive they were in trouble. Illusions created by the airfield environment probably were responsible for the pilots erring in several of these accidents. We could describe these as "they didn't see what they thought they saw." In other cases the problem was simply one of inadequate references that caused misjudgments, particularly at Class I and II (marginal for the type aircraft) airfields in SEA.

Incidentally, only about one-third of the landing-short accidents included in this study occurred in SEA.

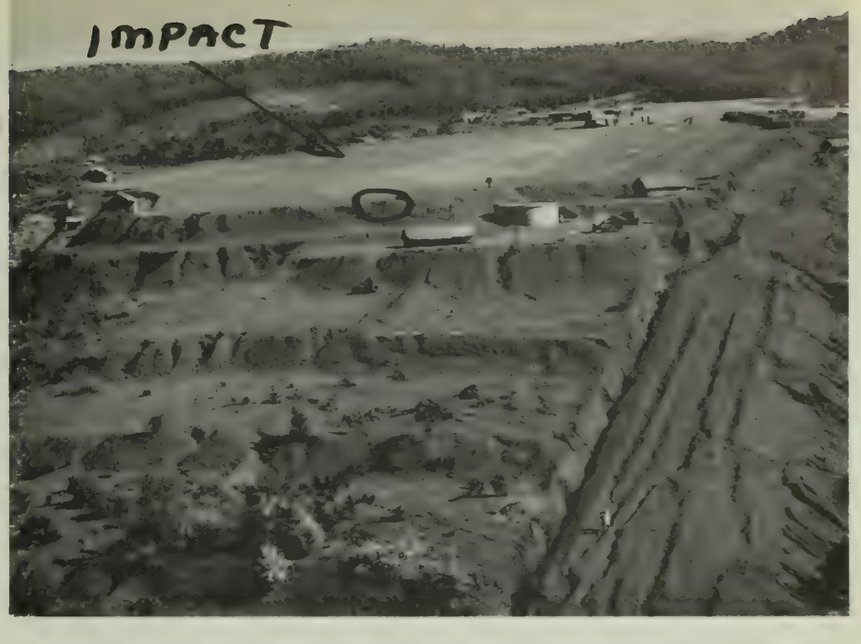
The facility problem covers a multitude of things such as short, narrow runways, no overruns, soft, unstable overruns, lips on the end of runways, obstacles. Despite these conditions, several accidents probably could have been prevented by VFR landing aids such as VASI, approach lights, better runway lighting. These may be impractical in some locations in the combat zone, but there appears to be a need for a simple, reliable, relatively invulnerable landing aid. Ideally this would be electronic to provide at least a glide slope. However, some very simple devices have been developed. One of these, which the Navy uses, is shown in Figure 2.

Except where it would be impractical, VASI is useful. But as of 1 December it was reported that there were 24 USAF bases in the U.S. that did not have VASI installed.

Although weather appeared only as a contributing factor in accidents covered in the study, combined with other problems it made for some extremely sticky situations For example, a night landing with bare minimums in a driving rainstorm. Then add an airfield with marginal lighting. This is one heck of a good way to manufacture an accident.

Some situations made an accident inevitable. Others are such that, if uncorrected, accidents can be expected to happen. In the broad picture of landing-short accidents for the past few years certain things stand out:

Although there were a few maintenance or materiel failure induced accidents, and quite a few due to the SEA environment, well over half of these accidents occurred outside of SEA, in day VFR weather in normally functioning aircraft. ★



POMOLA. Poor Man's Optical Landing Aid. Still in use at some U. S. Navy airfields, device consists of three wooden panels to indicate position of aircraft relative to approach slope. This or similar device may be of value at austere airfields such as the one shown above.

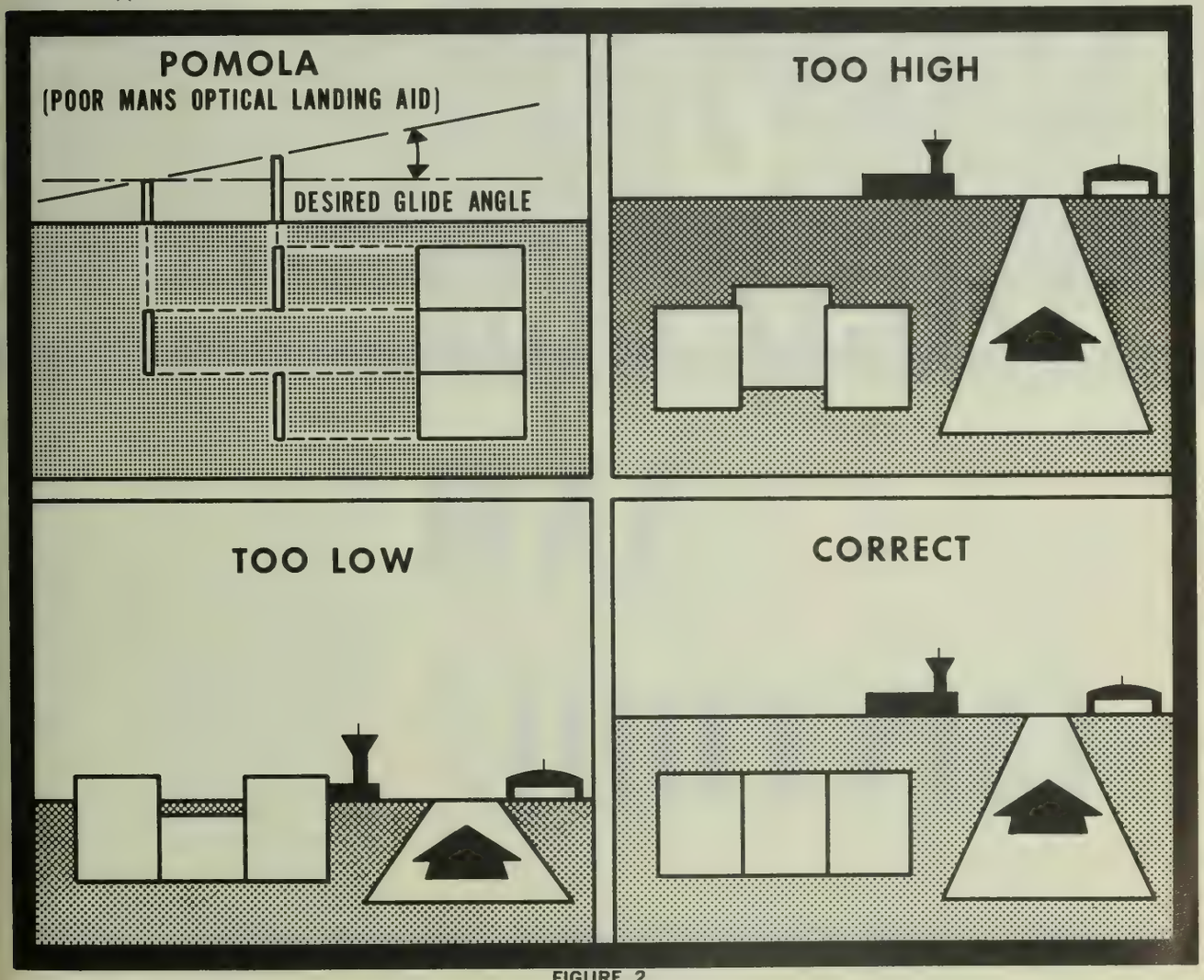


FIGURE 2

IF YOU WANT TO KEEP FLYING . . .

"MAINTAIN AIRSPEED AND CONTROL"

Last spring two pilots and an observer were killed and one pilot severely injured in a pair of almost identical accidents in very different parts of the world but in the same type of airplane. These accidents plus others of similar nature point to a void that somehow must be filled. Perhaps a brief summary and discussion will help.

The aircraft involved were O-2As, a relatively simple machine with two centerline-mounted engines, one in front and the other mounted on the aft end of the fuselage. Both aircraft had engine failure due to fuel starvation; both were very near runways when the emergency occurred.

The first of these accidents occurred in Southeast Asia and involved a pilot and observer. After takeoff the pilot climbed to a position near the field and went into orbit while awaiting a convoy he was to escort. Suddenly he noticed a loss of thrust, saw that the rear engine fuel flow had gone to zero, and the RPM was decreasing. He immediately shoved both throttles to full open and turned the rear engine fuel boost switch to high but the engine would not restart. His attempts to feather the rear



engine failed; however, the prop apparently quit turning and was stationary at impact.

Meanwhile, the pilot flew to a close downwind and prepared to land. He called the tower, lowered the gear, put down one-third flaps and began a tight 180-degree turn to final. Both he and a witness said that the rate of turn was much less than they would have expected from the angle of bank, and the aircraft seemed to be sinking quite rapidly. From this testimony the Board concluded that the pilot did not use enough rudder and the aircraft was slipping in the turn. The front engine surged, due possibly to the low fuel state of the tank and the aircraft attitude, or possibly because the propeller was not set for full power. However, post analysis showed that the engine was developing power at impact.

When the pilot saw that he could not reach the runway, he looked for a place to land and noted that his airspeed was down to 60 KIAS. Then the aircraft stalled, spun to the right and crashed.

Ten days later an IP and a student were killed under similar circumstances. From the evidence, which included witness statements, the board theorized that the in-

"MAINTAIN AIRSPEED AND CONTROL"

CONTINUED

structor was demonstrating a simulated forced landing at a dirt runway and that when he applied power for the go-around he discovered the rear engine inoperative. Apparently when he saw he could not maintain airspeed and altitude the IP attempted to land on the runway.

The aircraft meanwhile had got very low and overshot the runway in the turn. Then apparently the decision was made to attempt a landing in an open field. This required a steep turn. The aircraft stalled, rotated right and hit the ground in a right wing and nose low attitude.

In both of these accidents the failed engines were found to be operating on the auxiliary tank, which had gone dry. Also neither pilot jettisoned external stores. While the pilot of the first aircraft took off with the fuel selector on the aux tanks, this was not definitely proven in the second case. Possibly the IP had selected AUX during the simulated forced landing demonstration. At any rate, both selectors were found on aux tank with only a slight amount of fuel in the left tank which feeds the front engine, and none in the right tank, which feeds the rear engine.

It is difficult to account for these accidents without going into other factors, the most obvious being the pilots themselves, their experience and the type of aircraft involved.

The pilot in the first case had approximately 60 hours O-2A time. Prior to transitioning into the O-2A his entire rated experience was in B-52s, about 1250 hours.

The instructor in the second accident was an old head with more than 6000 hours, practically all of which was in recips. He had about 300 hours O-2 time, most of it acquired in SEA. The student in this accident was a recent UPT graduate who was just starting training in the O-2A.

In examining the pilot factor one could easily conclude that the pilot in the first accident had only minimum experience in propeller-driven aircraft and that this may have contributed to his failure to safely manage the aircraft. There were several things that would point toward this conclusion. First, he failed to switch from AUX to main tanks prior to takeoff. It is standard practice in recips to check all tanks for feeding sometime prior to takeoff, then switch to the mains for takeoff. In trying to determine why he failed to switch to the mains, two things come into conflict. First, his experience in the B-52 and relatively short time in the O-2 may have resulted in his missing this important item—it had not become an automatic response. On the other hand, checklist discipline gained from his B-52 experience should have carried over to the O-2.

How to explain the pilot's possible omission to make this important check in the other accident is even more difficult because of his past experience. Perhaps both of these pilots were distracted, possibly by the occupant of the other seat.

One of the pilots failed to feather the prop on the failed engine and the other used the wrong procedure. Neither dropped stores, neither switched to a full tank and both of them had the landing gear down —one had the gear down the other placed it down.

According to the accident reports, the O-2A will not maintain altitude and airspeed in this configuration, which would make landing an immediate necessity from the altitudes they were at when the rear engines failed.

Even so, it would seem that both pilots had a very good chance to make a successful recovery for at least one of two reasons: (1) With plenty of fuel aboard, switching tanks should have produced an airstart; or (2) runways were available and with power from the front engine, making a landing should have been a relatively simple thing even for an inexperienced pilot.

In the Emergency Procedures Section of the Dash One, under ENGINE FAILURE DURING FLIGHT, the first line reads: "Maintain Airspeed and Control." In their concern with the immediate problems of analyzing the cause of the engine failure, feathering, and in one case getting the gear down, the pilots did not heed this all-important advice.

Why? Frankly, we don't know. But we do know that the O-2 and other light aircraft have demonstrated that they can kill you just as dead as can any supersonic jet. Therefore, they demand just as much respect from those who fly them and those who train the men who will fly them. ★



the GIB's BIPPY

—or, what've you got to lose?

It was to be a night re-check for the navigator in the back seat of an F-4. He'd flown in them before but it had been a couple of years ago. The briefings in the squadron brought it all back quickly and he was eager to get out to the bird. With the mission briefing completed and everyone ready to go, the crew headed for the airplane.

Before he mounted the ladder, the navigator watched the crew chief carry the nav bag full of maps and FLIP pubs up into the rear cockpit. It didn't register on him while he was strapping in that the bag was between the seat and the stick. While the nav was squaring away and getting reacquainted with the cockpit, he lowered the seat. This forced the nav bag against the stick, but he still failed to notice the potential for trouble.

While taxiing out, the pilot observed that aft stick movement was somewhat restricted, but he didn't think to challenge his back-seater about it. Passing 175 knots on takeoff roll, the pilot mentioned that he didn't think the bird was responding the way it should. But he continued the takeoff. The bird was still on the ground at 200-plus knots when the flaps blew up and finally became airborne with about 3000 feet of runway remaining!

Later in the flight, when the pilot asked his RIO for a frequency, the problem was identified. The GIB, reaching into his nav bag for the IFR Supplement, realized what had happened. And all this time the pilot, an old head in the airplane, had dismissed it all as no more than a bellows failure.

Still later in the evening, while the navigator was recounting the adventure for all who would listen, he was heard to mumble something about ". . . 200 knots and still on the deck, I should have ejected . . . and left the evidence to blow out of the cockpit! But you can bet your Bippy this GIB won't store anything in front of the seat any more!!"

The lesson about stowing gear of any kind in front of the seat applies to all airplanes. And we should not really need to repeat it here. Like it's pretty basic—as is the lesson about taking off with restricted control movement!,

However, there's a problem—and a lesson — here for F-4 drivers which is a bit more subtle but equally hazardous. It concerns placing any kind of gear in a position where it can get under the rocket seat. This is considered an effective way of of contributing to inadvertent rocket motor ignition—which brings up a whole new set of problems.

If, while you were flying with the H-5 seat, you built yourself a habit of storing shoes, letdown books, your special cross-country kit or anything else in that little space under the seat—*break the habit* quick before you tangle with the machinery under the H-7 seat and ruin your whole day.

(Adapted from CROSSFEED) ★

crowd-pleaser



CLIMB OR

Standing on the ramp in front of Base Ops during a refueling stop, I watched an F-104 whistle up initial and into the break. There are so few of the beautiful things left, you always watch. When I'd followed him through the turn, wings level on downwind and gear extended, I glanced around me. Of the few people in sight on that quiet afternoon, only one didn't have his eyes on the sleek bird in the pattern. It's that kind of airplane.

I watched him around the turn, lined up on final and marveled at the speed of his touchdown, although I've seen it many times before. Smooth and precise, it was. Professional. But something about his rollout bothered me. Then I caught it . . . no drag chute!

Trouble?

No, there didn't seem to be a problem. He was going away now, and it was difficult to tell how hard his braking efforts were. But he turned off at the end with apparent ease.

It was a few minutes before he taxied past us to park on the transient line. The people around me made the normal comments about the airplane . . . "It's all engine, isn't it!" or, "He's just sitting there on thrust, isn't he?" None of them seemed to be wondering, as I was, why he had not used his drag





CRASH ?

chute. I had made up my mind: he's a transient in a hurry. And he's sure of himself.

Watch him!

And I did. The bird had hardly rocked to a stop, the engine had barely whined down, when I saw the pilot vault over the rail to the ground. He couldn't wait for a ladder. Impressive.

And telling.

This guy does bear watching.

After only a brief pause in front of the airplane while he talked to the Transient Alert crewman, he was striding across the pavement toward the Base Ops door.

Of course, I was watching for him when he burst out of the double doors and marched back out to his airplane. In short order he was fired up and taxiing. A pause at the end of the runway, and he was turning to line up with the runway. Then he was rolling, accelerating the way a '104 should. When he passed Base Ops he was beginning to rotate, and shortly he was airborne. The gear snapped into the wells as the nose continued to rise. Too much, I thought, he's trying too hard. Not enough speed for a truly impressive climb, but he's trying.

Well, the climb was impressive after all. To any layman, and even to most people with professional knowledge of airplanes, the extreme pitch attitude was impressive. And the rate of climb was enough more than most airplanes to attract admiring onlookers and complimentary comments.

But the rate of climb could have been a lot greater and a lot safer if the pilot had thought for a moment about the effects of airspeed on drag and thrust. Specifically, when he succumbed to the desire to do a bit of grandstanding (and it was a beautiful, clear, cold, invigorating day for it), he didn't plan his little demonstration to use the excess thrust of his airplane to the best advantage. Rotating early, he flew off at extreme angle of attack. By holding that angle of attack while trying to make an impressive climb, he was pulling an unnecessarily large amount of drag along with him. The drag kept him from accelerating, kept angle of attack high . . . and kept him from climbing at max rate of climb. Not only was his show less than best, he stayed perilously close to stall for a significant period of time while he was still very close to the ground.

He was soon out of sight, his con mixing with those of the airliners passing overhead. And then we were refueled, strapped in and on our own way. At home that night my thoughts returned to the mini-airshow and the F-104 pilot's false assumption that maximum nose up after takeoff equals max climb. I found myself going back to a similar, but far less successful, grandstanding attempt I had heard of a few years back. One where a C-130 pilot overseas tried a max performance, extreme pitch attitude, high angle of attack takeoff . . . and didn't succeed. He rotated early, was airborne after minimum run and disappeared into the low overcast in a startling, nose-high attitude. Seconds later, and only a few thousand feet down the runway, he reappeared from the low clouds in a 70-degree nose down attitude. He did not recover from the dive.

crowd-pleaser

CONTINUED

A C-130, even light weight, does not have the thrust to overcome exaggerated angle of attack that the F-104 has.

Both of these pilots were led astray because they did not understand induced drag and how it affects something called excess thrust. For simplicity's sake, we'll call excess thrust that amount of thrust your power plant is generating above the minimum required to overcome drag and maintain your aircraft, at a given weight and airspeed, in level flight. Therefore, the amount of excess thrust you can coax out of your machine will directly relate to your climb capability.

Total drag, and therefore excess thrust, are controlled by airspeed. At low airspeed, as in takeoff and climb, total drag is directly related to angle of attack (alpha). When you plot drag against airspeed this becomes more obvious. At minimum flight speed (just above stall) a large amount of drag is caused by the wing at high alpha. As airspeed increases, and angle of attack decreases, this induced drag drops off. The induced drag curve flattens out considerably, but as airspeed continues to increase, parasite drag increases. It eventually reaches values at high alpha which are much greater than induced drag.

The point where the two curves cross is the point of minimum total drag. It is also the point where you observe maximum excess thrust in many airplanes. When airspeed either increases or decreases from this point, more of the thrust available is used to offset drag and keep your bird in the air.

Now it makes sense, doesn't it? In an airplane with constant thrust, best sustained climb performance is going to be at that point where drag is minimum. Your best climb certainly is not ten or twenty knots above stall (or takeoff) speed where induced drag cuts significantly into the excess thrust your machine is capable of producing.

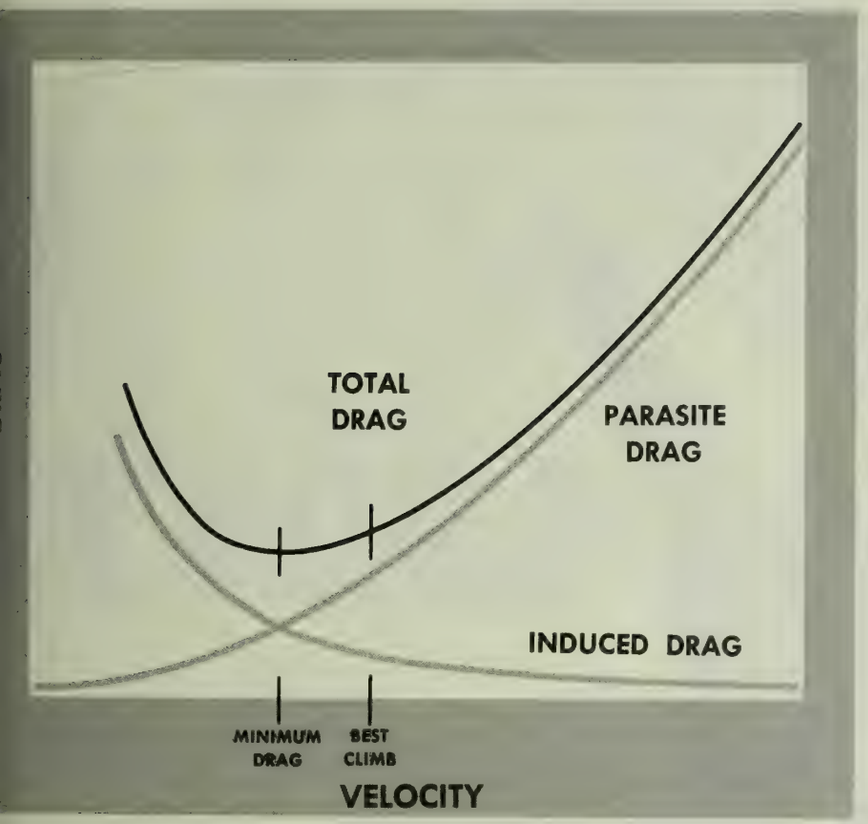
Okay, you say, that's fine. Best climb speed for an airplane producing constant thrust is the point where drag is minimum. All I have to do is monitor the Total Drag Indicator carefully during my cross-check and I'll have it made. Since I haven't seen an airplane with a drag indicator on the panel, what does all this mean to me? Is this another gem of aeronautical information that I can't reach from the cockpit . . . that's nice to have handy when it comes to impressing friends and acquaintances at the bar?

No, it's a lot more than that. You *can* reach it from the cockpit. The airspeed that coincides with minimum drag is your best glide speed. And that's in every Dash One. You should know it.

Now, carry this a little further and you come to recommended climb speed. In non-turbojet aircraft you'll find the recommended climb speed is close to, but a little above best glide speed. It's above glide speed to account for the energy you dissipate while rotating to climb attitude.

The energy dissipated while you rotate from acceleration to climb attitude doesn't require a lot of explanation. It's easy to see that if you rotate right at best glide speed, you will probably have less than that speed when you arrive at your intended climb attitude. You will have less than max excess thrust at your command, and will be in real danger of falling farther behind the power curve. This is most important in birds with limited excess thrust — transports, bombers or fighters at heavy gross weights. Turbojet engine thrust generally increases with airspeed throughout the speed range of the aircraft. Therefore fighters in a clean configuration have plenty of excess thrust. They are capable of rotating at almost any speed and still retaining enough thrust advantage to continue to accelerate and climb. These birds encounter a different set of problems that are primarily concerned with pitch attitude. To the unthinking or uninformed, pitch attitude relates directly to rate of climb, but think about it for a minute.

At 30 degrees of pitch, the vertical component (vertical speed) of your climb vector equals 50 per cent of your true airspeed. At 50 degrees, vertical speed is approximately three-fourths of true air speed. And at 60 degrees pitch only ten per cent more of your air speed is converted to climb. Fifty degrees of pitch is not desirable because you are in the area where airspeed bleed off is becoming severe. Around 40 degrees and above, pitch attitude requires extremely close attention to maintain airspeed. Once you allow the speed to start decreasing without immediately reducing pitch, you will find that airspeed is disappearing faster than you can push the airplane over. Before you know it, you have backed yourself into a critical near-stall condition with the nose still high in the air. You not only have a very serious control problem on your hands, but your climb demonstration has completely ceased to be a climb demonstration. Few on-



lookers are impressed by a recovery from unusual attitudes at low altitude.

To bring all this into focus, let's look at the F-4. The Dash One lists two climb schedules: 350 KIAS to cruise Mach, and 350 KIAS to .9 Mach. The 350 schedule assures you plenty of excess thrust, and it also keeps you at a pitch attitude you can comfortably control. At that speed and attitude, your forward speed gives you over 10,000 feet per minute up to start, and increases as true airspeed increases in the climb! That's impressive from the ground. You'll find you're holding about 25 degrees on the attitude indicator. And when you look outside you'll feel like it's a lot more.

So what's this all boil down to? You *can* make a demonstration climb in any bird if you know what you're doing. If you think in terms of thrust and drag. And when you're thinking this way, you'll rapidly come up with figures that closely resemble the climb schedule in the book. But you must temper your desire to make it look good to the folks on the ground with a sober evaluation of the machine you are flying.

- In a heavy, high-drag airplane, whether it is a many-motor model or a fighter with a lot of drag devices hanging under it, you must keep in mind the energy dissipated in rotation. Certainly you must stay above best glide speed.
- In a light fighter, you are concerned with over-rotation and rapid airspeed bleed-off. G-loading in the rotation and rate of G application are important here. Both can get you into trouble. Overshoot to a steeper attitude than you intended, and you are immediately faced with rapidly decreasing airspeed.

Let's face it, you can make a good crowd-pleaser out of a tech-order climb in a light-weight, high-performance fighter. Few of your admirers on the ground will be able to detect the difference between 10,000 feet per minute and 15,000 . . . when you will be out of sight in about a minute anyway.

In any other type or configuration, a tech-order climb may not be as spectacular, but you're better off giving them a show of good, professional airmanship than attempting something the bird was not designed for . . . and falling flat on your face!

Don Stuck, test pilot for McDonnell Aircraft Company wrote a few years ago in Tiger Talk II that ". . . for my money there is *no* method for tactical application which can provide any significant improvement over the properly executed handbook takeoff technique." He goes on to say, "After the aircraft breaks ground, it can only do one of three things to impress a crowd.

- Crash,
- Maneuver close to the ground to include acrobatics and low speed flight,
- Climb."

Don't laugh at Number 1. If your post-takeoff climb is not carefully planned and properly executed, you stand a good chance of providing a lot more "show" than you were counting on.

Leave Number 2 for the experts. There are rules about those things.

And when you get to Number 3, think about excess thrust. Quoting Don Stuck again, "It is obvious that you can't climb without pointing up. It is also obvious that you can't climb after you are pointed up if you have no forward speed. The best trade-off or cross-over point is what we're looking for."

And that's a tech-order climb. ★


DON'T

1969 experience reinforces that oft-repeated advice on ejections . . .

AIT.. GO NOW

ROBERT H. SHANNON • **Directorate of Aerospace Safety**

Ejection attempts outside the envelope helped drive the USAF ejection success rate for 1969 to the lowest figure in 11 years.

If you fly an ejection system equipped aircraft, go back and reread the preceding paragraph.

Through December 10, there were 162 ejections in 1969, only 127 of which were successful—non-fatal—for a 78 per cent success rate. With the improvements in ejection systems in recent years the obvious question is why? There are some very good reasons and aircrews should understand what they are and what can be done to improve the situation.

The following is based on a critical, in-depth review of information submitted concerning the 35 crewmembers who did not make it.

The experience by aircraft type shows an 82 per cent success rate for fighters, 85 per cent for trainers, only 53 per cent for bombers, and 83 per cent for other type aircraft such as the A-1 and OV-10. With the possible exception of the trainer types, these are all considerably lower than we have observed over the years. The low percentage for bombers was entirely the result of one aircraft, the B-52. There was *not* a successful ejection from the B-52 in nine attempts last year.

The 35 fatalities were categorized as follows:

OUT OF THE ENVELOPE

Ejected out of the low level capabilities of the system involved, i.e., time available for completion of the ejection sequence was less than the time required, due to insufficient terrain clearance, bad attitude, high sink rate, and sometimes low airspeed. This accounted for 23 (65 per cent) of the total.



SYSTEM FAILURES

Three fatalities (9 per cent) were due to system failures. These were definitely identified system failures and do not include difficulties such as seat-man-chute interference, inadvertent lap belt opening, etc.

OTHER

The remaining nine (26 per cent) cases were categorized as "other" or, if you will, "misadventures." These are usually conditions that occur during within-the-envelope ejection.

Of the 23 out-of-the-envelope fatalities, 11 involved significant delays in initiating the escape sequence. Two of these were the result of attempts to avoid populated areas, six pilots delayed escape in an effort to overcome a problem, and one was attributed to possible confusion following a midair collision. In two cases, the cause of the delay could not be determined. In ten of the eleven, an earlier decision probably would have resulted in a successful rather than a fatal ejection.

Perhaps there isn't much that can be done to preclude delays due to attempts to spare the civilian populace or those that result from a traumatic experience such as a midair collision. However, staying with an obviously disabled aircraft while trying to overcome a hopeless situation, to the point where survival becomes marginal, is not only unrealistic but downright foolhardy.

Evidence indicated that in some of these cases the crewmember's decision was influenced by a misconception. He was told that his escape system had been modified to increase the escape envelope. This is true, but it is apparent that many crewmembers do not really understand the real intent of these egress system update programs. We can't emphasize enough the necessity for an early decision to eject. Aircrews must understand that improvements to escape systems are incorporated for the sole purpose of enhancing survival should it become necessary to eject in a marginal situation. System improvements should *never* be the basis for staying with the aircraft "just a little longer" to try to bring it in.

Our analysis also disclosed that at least five of the out-of-the-envelope fatalities might have been prevented had the systems involved incorporated available modifications developed to improve the success of ejection escape.

In the three cases involving system failures, one was due to delayed ignition of the rocket catapult which caused extensive damage to the back of the seat. The damage caused the survival kit to become jammed in the seat, preventing separation. The pilot deployed the chute manually while in the seat; however, it became entangled with the seat and did not inflate. The problem of delayed catapult ignition was immediately fixed by a crash program. Unfortunately this problem was not brought to light until a life was lost.

In another case, involving an F-4, the scissor shackle failed to open because of a bent guard that had been incorporated with the recent egress system update program. This prevented withdrawal of the parachute drogue line which allowed the seat, man and parachute to descend as a unit. The seat, which remained attached to the withdrawal line, swung like a pendulum striking the pilot a lethal blow to the head.

The third system failure involved the force-deployed parachute. The cartridge, which deploys the drogue slug, did not fire due to a defective primer. The ejection occurred at a very low altitude and there was not enough time to manually deploy the parachute. When two other defective primers were found, the force-deployed parachute was temporarily removed from service. An around-the-clock effort is under way to correct this problem.

The force-deployed parachute is considered to be a good system and we are very concerned over the fact that involved crewmembers have been temporarily denied the added capability provided by this system. However, removal of the parachute pending fix was the only course of action open at the time. We are lending all possible support to insure that the force-deployed parachute is reinstated as soon as possible.

The *nine* fatalities classified as "other" are the misadventures that cause a within-the-envelope ejection to terminate in a fatality. Two of these involved seat-man-chute interference in one of which the man was struck by the other crewmember's seat after separation. This was a tandem aircraft and both ejections were apparently normal in all respects up to this point. To the best of our knowledge, this is the first such occurrence.



Two crewmembers failed to survive parachute water landings: one was drowned and another is missing. In the former, there is rather strong evidence that an unidentified system failure may have contributed to the fatality. The pilot was struck and apparently incapacitated by an unknown object. The seat and parachute were not recovered.

Inadvertent opening of the manual lap belt release contributed to one fatality. Although the conditions of ejection were marginal, it was concluded that the pilot would probably have survived if the automatic function of the parachute had not been lost. A possibility exists that this pilot *did not* attach the gold key.

In another case, it was definitely established that the gold key *was not* attached in an ejection that was initiated at about 12,000 feet AGL. For unknown reasons, the pilot did not attempt to manually deploy his parachute. This pilot apparently just plain forgot to attach the gold key. He had been flying recently with the force-deployed parachute which, of course, does not utilize the parachute arming lanyard.

Failure to separate from the seat from unknown causes, resulted in one fatality. The crewman impacted in the seat approximately three and one-half seconds after the lap belt fired. There is a slight possibility that he was hung up in the seat; however, it appears more likely that he held onto the seat handles. The ejection seat in this case does not incorporate a seat-man separator.

One pilot died in a low-level ejection when he descended into the fire ball of the wreckage. It is not known at this time if death was due to burns or free-fall when the parachute was rendered inoperable.

The final case is almost unbelievable. It occurred just recently, and although all the factors involved are not known as of this writing, the best evidence available indicates the pilot did not have his parachute risers attached to his harness. On deployment, he and the canopy separated.

In summary, then, the box score as of December 10 was 35 fatalities, 17 of which could have been prevented through the application of known available resources. The rate could have been a relatively high 89 per cent instead of a tragic 78 per cent.

When we talk about preventable fatalities, we do not mean to write off the non-survivable, out-of-the-envelope fatalities. The non-survivables mean just that. There are no systems in existence today that could have prevented these deaths. The ejections were attempted at the last possible moment when it was obvious that there was absolutely no hope for survival. This does not mean that our technology cannot and will not ultimately design systems that will effectively deal with any and all conditions. The attainable goal should be as near to 100 per cent success as possible. As a realist, I do not think we will ever reach 100 per cent. Regardless of the capability designed into the system, there will always be individuals who will push it beyond its maximum limits.

Failure to use the zero lanyard, failure to attach the parachute arming lanyard, failure to connect the parachute risers to the harness, holding onto seat actuating controls, delaying the decision to eject, all point up the need for a re-evaluation of current training programs. Until such time as all egress systems incorporate the latest state-of-the-art features, which is not in the foreseeable future, we must make the most of what we have. We must provide the crewmember a thorough knowledge of his equipment. His training in the use of this equipment must be the very best and as frequent as necessary to insure that his response to an emergency is an automatic reflex action. And he must know how to cope with any unusual "misadventure" that may occur.

But perhaps even more important, present egress system update programs must be continued and renewed emphasis placed on quality control procedures and system maintenance. ★



REX RILEY'S CROSS COUNTRY NOTES



IN THE ARTICLE starting on page 15 of this issue you'll find two cases of unsuccessful ejection which were attributed to failure of the pilot to hook up to an important part of his ejection equipment. In one case an instructor pilot in a dual airplane failed to attach the arming lanyard gold key to his lap belt. Without it he lost all automatic features of his system. And it appears that he did not pull his D-ring.

The second case is truly hard to believe. Here, the pilot in the back seat of an F-4 did not connect his parachute risers to his harness. The system worked as designed: the seat left the airplane, the parachute deployed. *But the pilot wasn't connected to the parachute.*

You can attribute both of these to over-familiarity, relegating the procedure of strapping into an airplane to automatic actions which one accomplishes with little or no conscious attention. Once you develop a habit pattern, each action follows the one before it without a hitch — until something interrupts the sequence.

Habit patterns of this nature are unavoidable, really, in actions you repeat very frequently. You reach in your pocket for your keys as you approach the car; as you slam the door with one hand, the other is inserting the key in the ignition. Or, climbing in your favorite fighter, you place your left hand in one specific position and your right hand in another each time. You swing your weight into the seat in the same manner each time. Then body, hand and arm movements flow smoothly and automatically until you are all strapped in.

There's nothing wrong with this habit pattern business. It speeds up the routine, mechanical things we must do every day. And it leaves us free to occupy our minds with more challenging and varying activities. But don't trip on this one . . . these other activities are not necessarily more important. As a matter of fact, we perform many important and critical activities with little conscious thought. Like strapping into the life-saving systems in an airplane.

The critically important thing is to recognize that we do things this way. Recognize the possibility of interrupted patterns, overlooked steps. And recognize that the overlooked steps in the sequence may be terribly easy to skip completely. It would be immediately obvious if you failed to place your left hand

on the canopy bow before you swung yourself over the rail to get into the bird. But when would you notice, in the course of other habit-enshrouded actions, that you hadn't connected yourself to your parachute?

Best to build some checks into your routine. If you're riding a seat in which you hook the parachute to you after you sit down, as in the F-4 or A-1, lean forward against the inertia reel at a specific point in your pre-takeoff preparations (maybe just before brake release or before you take the runway). Consciously . . . and conscientiously . . . build this habit as a check on other automatic actions you take. In a bird with equipment that calls for a "pins-canopy-lanyard" check, *look* at the gold key when you feel for the lanyard.

Take some time to analyze the automatic actions you take in your cockpit. Look for the pitfalls, the items which, when overlooked, would not normally come to your attention in the course of later actions. Then establish a check on these critical items.

A final note on this subject. No habit pattern is going to be unbreakable or perfect. Don't let the checks you build into your routine also become automatic. Don't allow yourself to get to the point where you lean against the inertia reel to check the risers, feel no resistance, but press on to other matters because you have performed the check.

I guess it all boils down to one thing. There are several points in getting ready to fly (as well as flying itself) where you just have to think! ★



BIRD ATTACK. Although the incident to follow occurred early in December, when birds were migrating south, it won't be long til the fowl will be going the other way, so be alert. The crew of a C-130 saw what they at first thought was smoke from a multi-jet aircraft. When they got a bit closer they saw that the "smoke" was a huge flight of birds stretched from horizon to horizon. It was apparent that they couldn't get above them, so they tried to descend and go under. Then a flight of birds left the formation and headed down. At about 400 feet AGL the aluminum bird met the feathered flock and took out five of them, one of which caused some damage to the aircraft.



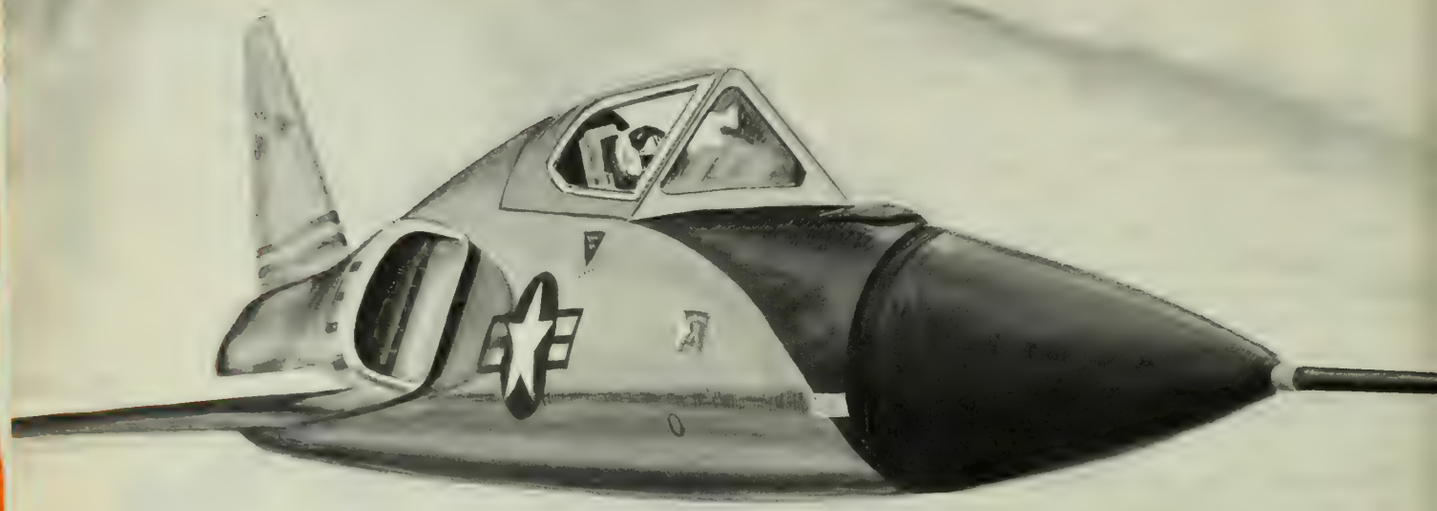
WINTER OPERATIONS. One of the winter flying problems that seldom gets advance attention is the increase in takeoff acceleration on cold days — and the increased possibility of exceeding gear-down speed on takeoff.

Most of us have developed a certain timing or rhythm for the many items that clamor for our attention during the first few seconds after liftoff — engine instruments, runway alignment, gear up, flaps if we use them, accelerate to climb speed and press on.

On many airplanes, we hesitate while the flaps are coming up — watching the slight sink or adjusting angle of attack to keep a climb going while the wing is being reconfigured. And after we once become accustomed to a particular airplane, there's no difficulty in performing these various chores in plenty of time. On all but the coldest days we have no difficulty getting the gear tucked in and the doors closed before we reach the magic airspeed the Dash One calls max.

But on the cold days, look out! That nice, comfortable rhythm you've developed may be just what catches you. You look at the airspeed meter and then the gear indicators and find that you've done it — exceeded the gear speed.

Don't grab for the gear handle — even though it is the first thing that comes into your mind. First, slow the bird below gear speed by raising the nose. Be careful about reducing power. *Then* cycle the gear. You're less likely to be embarrassed when the crew chief asks what happened to your gear doors. ★



into the hillside..

"IF NO TRANSMISSIONS ARE RECEIVED FOR TWO MINUTES ON THIS VECTOR OR FIVE SECONDS ON PAR FINAL PROCEED VFR; IF UNABLE, EXECUTE AN ILS APPROACH. IF THIS IS NOT POSSIBLE, THEN EXECUTE ANY OTHER PUBLISHED APPROACH AS APPROPRIATE."

There is something unusual in the lost communications instructions above. Did you catch it? " . . . *two* minutes on this vector . . ."

You probably did not catch the change from the normal one minute procedure until you read through it a second time. And this is the way most of us treat lost communications procedures when we hear them from a radar controller. We've heard them so often in the past that we hardly listen to them. They're always the same.

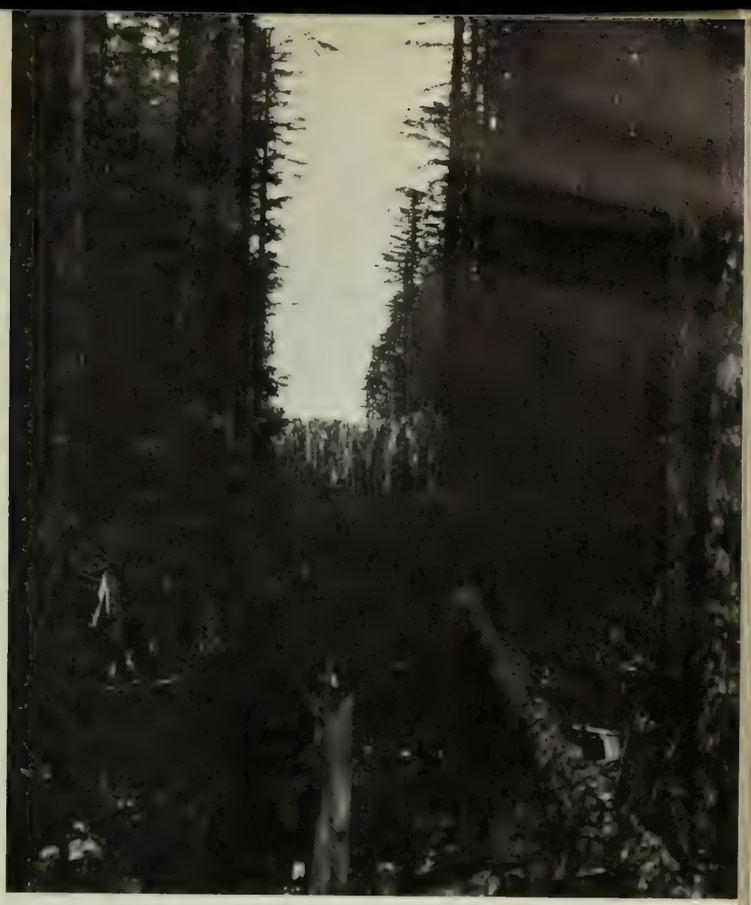
One stateside base took this approach and decided it was unnecessary to repeat the instructions every time a local pilot makes a radar vector approach. They printed the lost comm procedure as quoted above in their base 55-series manual and told local pilots they were expected to comply with it. On the surface it appeared to be a good idea, it saved a lot of time and chatter during periods of heavy recovery traffic.

But it didn't save an airplane and a pilot. One morning last year a fighter pilot from that base lost communications with the radar approach control shortly after he descended into a low cloud deck while being vectored to GCA final. He was level, about 2500 feet above field elevation, when he last received and acknowledged a transmission. Three minutes and forty-five seconds later, in level flight and on the last heading he had acknowledged, he flew into a hill.

Trouble started when he was directed to change frequency after a flight break-up. He called several times, on several frequencies. The controller attempted to contact him many times. He received and acknowledged a heading change, but at that time he probably was not transmitting on the frequency the controller was monitoring. In the time between that heading change and impact, calls were made from Approach Control and Center on Guard, the TVOR frequency and several approach control frequencies, directing the pilot to make an emergency turn and climb.

This pilot failed to take several actions which he would be expected to take. Any of them would have saved his life. He failed to:

- Monitor Guard channel. The function selector on his UHF radio control panel was found in the Main, rather than Both position.
- Monitor the TVOR frequency or use his Data Link receiver as a backup UHF receiver. Squadron procedures directed the use of ILS receiver to monitor TVOR voice, and Data Link to backup the UHF control frequency.
- Check his position on TA-



STRAIGHT AND LEVEL NEARLY FOUR MINUTES AFTER THE LAST TRANSMISSION.

CAN relative to the airfield. His equipment was functioning, indicating the correct location at impact. Although the heading he was flying was normal for a radar approach to the field, he was several miles outside the normal pattern.

• Identify the frequency he was calling on. He made several calls on frequencies other than the one last assigned. Had he made it clear to the controller that he was on another channel, and which one it was, they would have had a better chance of getting together.

But most important, he failed to comply with the established lost communication instructions when he was unable to contact his controller for more than the prescribed two minutes.

It's the pilot's responsibility to take action when he loses radio contact during an approach. There's no other way. Although this pilot knew he had comm trouble, he continued on the same heading and altitude for nearly four minutes.

The manner in which the lost comm instructions were handled at this base may have helped to lull this pilot into overlooking them or not giving them the urgent attention they deserved. The procedure was not read to him as he started his approach. Certainly he was expected to know the procedure, but there was no active reminder which would be fresh in his mind when difficulties arose. Even if he didn't actually listen to the details of the procedure when it was read, recent exposure could be expected to trigger more reaction than he exhibited.

The lost comm period of two minutes instead of the one-minute standard may also have helped to set this one up. Few, if any, of us actually watch the clock after every transmission to see if a minute will elapse before the next one. But when you know in the back of your mind that you have two minutes instead of just one, the entire problem seems more remote. And when a controller knows that he need only transmit within two minutes instead of one, he may frequently exceed a minute or a minute and a half, particularly when he is busy. Pilots flying regularly in this environment become accustomed to longer periods of silence.

For years pilots have been flying into mountains minutes after they should have taken lost comm action. And unfortunately, we will continue to come up with accidents like this as long as we fly around in the clouds depending on instructions from the ground. There is only one way to prevent them.

Think lost comm! Be alarmed when you haven't heard that friendly voice for a while. If in doubt, call the guy and ask if he's still there. If the whole world's been quiet for a while and then you suddenly receive a transmission, it would be a good idea to double check with the controller to see if you've missed a transmission or two. And once you get into a scrambled-frequencies situation, watch the clock and be spring-loaded to the emergency procedure.

It's the only way. ★

he landed on a picnic ground but

THIS WAS NO PICNIC

The flight started as a fun thing. One doesn't often get the opportunity to pick up a brand new airplane at the factory and ferry it home. In this case, a single engine retractable — one of the latest models on the market — destined for the aero club.

Yes, the flight started as fun but it deteriorated into serious trouble brought on by an electrical malfunction, weather and inexperience, and finally ended in near-disaster. Fortunately the pilot sustained only minor injuries.

When the club had decided on the make and model of airplane to buy, one of the club officers who had been on the selection committee volunteered to go to the factory and ferry the new aircraft home. His offer was accepted and he duly set about the task. During the selection process he had flown the type one hour with an instructor and he received a ground checkout at the factory. Then he set off.

The first leg was just under five hours and uneventful. After refueling the pilot got a weather briefing in person at an FSS and filed VFR for home base, with an ETE of 3 + 45. The weather briefing indicated a cold front across his flight path with low ceilings that he would not be able to fly under.

In reviewing the history of this flight, it is apparent that the decisions made at this point ultimately culminated in the accident. Since he couldn't get through beneath the clouds, the pilot decided to file VFR on top with the intention of checking the weather enroute and making a decision later. Night was coming on and the pilot was relatively inexperienced (238 hours) and not instrument rated.

The flight departed at 1742 local which would put him into his destination at approximately 2127 local. Two hours after departure, as he approached Knobby Knoll VOR (all references to places are fictional), he called and asked for the weather. He was now at 10,500, VFR on top and, if the weather was not good, he intended to do a 180.

It was at this time that the pilot got his first nasty surprise. He noted that he was late passing the VOR and began to check his nav equipment. Finally he discovered



that the alternator was inoperative.

Meanwhile, the cloud tops were taking him higher, so he called the next radio on his route and asked for assistance in determining his position and selecting a suitable airport. By now he was at 12,500 and the FSS turned him over to Metropolitan Center. When he contacted the Center he reported that he was at 14,000 feet and the Center Controller located him 10 miles west of Knobby Knoll VOR. The Center established that the aircraft had 2 + 30 fuel remaining, that the pilot had been flying above 10,000 feet for about an hour and that he wanted vectors to the nearest airport he could get into.

The pilot, perhaps both over-anxious and over-confident, indicated to the Center that he was instrument qualified and that he could handle the weather and an instrument approach. The Center then vectored him toward Central City. To conserve the battery, the pilot turned off all unnecessary electrical equipment and lights. As the Center continued to direct him toward Central City and descended him to 7000 the battery gave out and the radio became inoperative.

Fortunately in a few minutes he broke into the clear, saw city lights below and descended to begin looking for an airport. It took a while with the charts but he finally identified the city. After flying around for about 45 minutes in a futile attempt to locate an airport, he spotted a flat area with flood lights on one side and went down to 800 feet to take a look at it (the place was a picnic ground parking area).

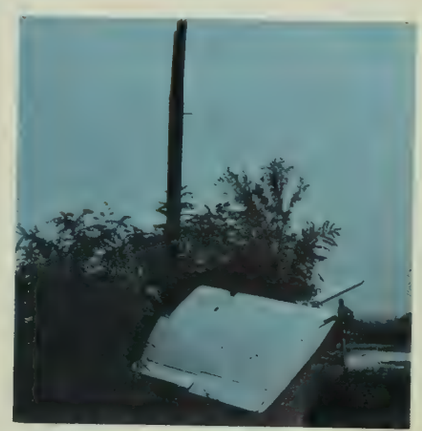
Deciding it was now or never, the pilot set up a tight pattern, slowed to near stall speed on final and prepared to land. Unfortunately the right wing tip hit a tree, which yawed the airplane slightly right. At about touchdown the right wing struck a light pole and sheared. The aircraft came to a stop and the pilot got out as quickly as possible. His only injury was a bump on the forehead.

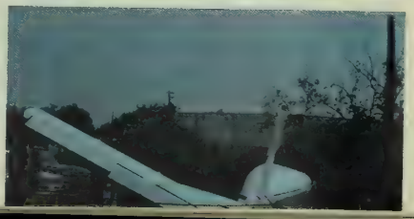
The investigation of this accident produced a number of findings as to causes and recommendations to prevent recurrence. Most of these revolve around the pilot: He failed to maintain VFR, misled the center controller into believing that he was instrument rated, violated the club rule and AFM 215-4 on night flying, failed to heed the club president's instructions in regard to night flying and to maintain VFR at all times, was not qualified in the aircraft IAW club procedures.

Other contributing causes included materiel failure and supervisory factor: Aero club supervisory personnel did not determine that the pilot was qualified in the aircraft, failed to review his proposed flight plan and did not brief the pilot on specific procedures to be followed during the ferry flight.

Air Force aero clubs have come a long way from the loosely organized groups they were a few years ago. This accident indicates that the improved management and procedures that have been established must be maintained. Further it lends credence to the old saying that a pilot is most dangerous between about 200 hours and 1000 hours of flying time. He has learned enough to be a proficient flyer but hasn't had enough emergencies to keep him from being over-confident of his still limited abilities. ★







The Behind-The-Line Pilot...

Maj Larree D. Chetelat, AFSC

The relationship between the flight manager and the attached pilot is often strained by a conflict between the pilot's loyalties to his desk and the cockpit. The flight manager would like all his pilots to act like fulltime pilots; the office boss wants fulltime desk operators. And the behind-the-lines pilot finds himself caught in the middle. Immediate, daily office pressures occupy him most of the time. He finds he must spend extra hours (often "non-duty" hours) at his flying job to remain current, competent and safe.

It's easy to let the flying job be come a secondary job. Professional advancement, OERs — the rest of his Air Force career — depend on his performance in the office.

If you're in this position and haven't taken stock of yourself recently, spend a few minutes to evaluate your own situation. Ask yourself the questions on this page. No one need know the answers but you.

And if you answer YES too many times, no one can do anything about it but you!

1. Do I wait until the last minute to notify scheduling when I am unable to keep a flying commitment?

2. Do I continually turn down weekend and night flights because of other commitments?

3. Do I show up at Base Operations so late that there isn't time for adequate flight planning before takeoff?

4. Do I study aircraft systems and procedures only before a flight check?

5. Do I wait until the last part of the six month period to complete a proportionate share of flying hour requirements?

6. Do I expect a flight examiner to tell me during the flight check what I already should know?

7. Do I ignore letters or scheduling forms when a reply is requested?

8. Am I frequently "too busy" to return a phone call to flight operations?

9. Do I frequently cancel or reschedule training flights?

10. Do I feel that my responsibilities in the office are so pressing and important that I can't afford two or three days away on an extended flying mission?

11. Do I neglect to keep myself current on flying publications, regulations, technical orders, and changes thereto?

12. Do I spend so little time practicing emergency bold face items that my reactions are questionable when the situation develops?

13. Do I consider my office duties so pressing that I don't have time to attend flying safety or aircrew meetings?

14. Do I feel slightly apprehensive strapping into the pilot's seat because I haven't flown for 30 days or more?

15. Do I feel that I have not given the flying job my complete support because that is not where my OER is written?

16. Do I tend to rely heavily on the other pilot to handle unusual circumstances instead of being personally on top of all situations?

(Adapted from AFSC *Professional Approach*) ★

the I.P.I.S. approach

By the USAF Instrument Pilot Instructor School, (ATC)) Randolph AFB, Texas

Q On a Radar approach (PAR-ASR), is the pilot informed of the landing runway?

A FAA Handbook 7110.8 states that Approach Information which includes runway in use will be given by Approach Control Facilities:

- Unless it is included in an ATIS broadcast for the airport of intended landing.
- When it has *not* been received by the pilot from ARTCC or another source. Therefore, the pilot should definitely receive the landing runway, probably more than once. If you don't get this information, you should request it since DH/MDA for the landing runway is necessary information for a safe approach and landing.

Q When does the radar controller give you weather information?

A Again referring to the FAA Handbook 7110.8, Approach Control Facilities are required to give you the ceiling and visibility if the ceiling at the airport of intended landing is reported below 1000 feet or below the highest circling minimum, whichever is greater, or the visibility is reported less than three miles. When such conditions exist, they will also transmit any known changes classified as special observations as soon as the volume of traffic, controller workload, and communications frequency congestion permit. This same requirement is listed under Radar approaches, so it is very possible that you will receive the weather information more than one time.

Q Who is responsible for designing and approving the instrument approach procedures for my home drome?

A AFR 60-27 states that each base commander is responsible for requesting publication of the minimum number of instrument approach procedures necessary. It is impossible to say who on your base actually designed the approach, but a good place to start your search is at your base operations. Approval authority for approach procedures rests with your Major Command or numbered Air Force. If the published approach procedures for your base do not conform to existing standards in JAFM 55-9 and/or charting specifications, it may be a good idea to inform the proper authorities through channels. Your Major Command or numbered Air Force is also responsible for annually reviewing all procedures to insure they conform to existing standards. On this same general subject, approach designers sometimes overlook the sentence in AFR 60-27 that is very important: "Simplicity of design and ease of use should be the keynote for all procedures."

AFM 51-37

By the time you read this, if everything goes as planned, a complete revision of AFM 51-37, *Instrument Flying*, should be well down the road toward publication. (The actual date the manual will reach the field is uncertain.) As you probaby know, there is quite a time lapse between final draft and publication/distribution. As fast as changes occur in this day and age, it is impossible to furnish you a perfectly current manual. We have tried to revise, rewrite, rearrange, add to, and update material so that the end product will provide adequate guidance for instrument flight under most circumstances. It will *not* be, and was never meant to be, a substitute for sound judgment. This philosophy was followed throughout the revision. We tried to avoid restricting the pilot whose knowledge and experience allow him to perform better by adding sound judgment to procedures and techniques.

Some of the major changes include a complete rewrite of Chapter 2, now called Illusions of Instrument Flying; a completely revised and updated Chapter 6, Angle of Attack; a new Chapter 13, Nonprecision Terminal Instrument Approaches, which includes a lot of information previously found in the VOR and TACAN chapters; elimination of the old Chapter 17, Integrated Flight Instrument Systems, as this information is now included in other chapters, mainly Chapter 10, Navigational Instruments; and a major overhaul of Chapters 16, 17 and 18, Radar Approaches, ILS, and Landing From an Instrument Approach.

Drafts of the manual were sent to every Major Command for their inputs and approval. We sincerely hope you will find the end product improved and, above all, useful.

If you have questions about anything related to instrument flying, just let us know.

USAF IPIS (FT-IPIS-PS)
Randolph AFB TX 78148 ★

AERO BITS



GEAR UP. Would you believe that a USAF senior pilot, with a commercial license, landed an aero club T-34 gear up at an Air Force base? We are not trying to ridicule this pilot. Who knows who will be next? We pass this on just to jog your gray matter with the realization that it can happen, no matter how many hours you have or how many aeronautical ratings you possess.

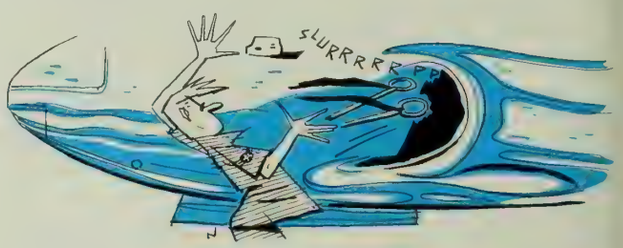
Over the years we have managed to stack up quite a number of items each designed to prevent just such a happening. We have warning horns, indicators, lights, checklists and the tower operator. And we have some procedures we are all familiar with but sometimes ignore. Like, when distracted, re-accomplish the before-landing-checklist before turning final. Like pulling the throttle all the way back to check the warning horn. Like making a last check for lights or indicators on final. Like not making an assumption and replying to the controller's query with an automatic "gear down" or similar phraseology.

Lt Col Thurman Lawrence, Jr.
Directorate of Aerospace Safety



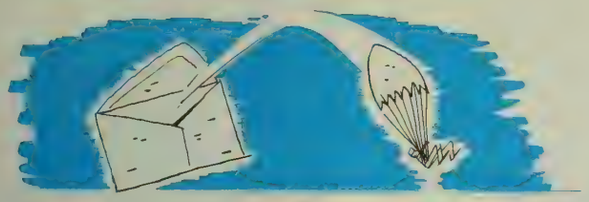
CHAFED HYDRAULIC LINES. Loss of hydraulic fluid resulted in a gear-up landing in an O-2. The pilot put it down smoothly in foam and the aircraft received only very minor damage. When the maintenance types looked for the cause they found that the alternator blast tube was chafing a hydraulic line and eventually wore a hole in the line. Both the line and the blast tube were correctly installed but apparently when air was flowing through the tube it caused the tube to vibrate against the hydraulic line.

Following this incident all O-2s at the base were inspected and three nose gear down lines were replaced because of chafing. Additional clamps were installed where required and the unit has requested that aluminum hydraulic lines be replaced with stainless steel tubing. The inspection also revealed chafing of gear-up hydraulic lines under the cockpit floor by the aileron control cable.



PINS AGAIN. This one is a bit ironic but it demonstrated again that constant vigilance is the password around aircraft. The crew of a T-33 was completing the before-taxi check with an airman stationed near the left wing tip. The pilot in the front cockpit was having difficulty closing the canopy and called for a check of the rear canopy. The guy in back was having trouble too so the airman moved in to assist him. In his right hand he had the pins and pitot cover and as he reached up with his left hand to help the pilot, the pins and cover were sucked out of his right hand and into the engine.

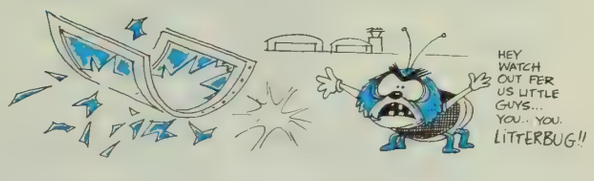
The ironic part is that this airman had previously been an instructor at Sheppard where one of his subjects was FOD. Aside from the fact that he had the items in his hand, he should never have approached so closely to the aircraft with the engines running.



TOO LATE . . . TOO LATE. During an air to ground range sortie, the number two F-4 in the flight was observed to nose over from 10,000 feet. Although the flight leader called repeatedly on the radio, there was no response from his wingman. The aircraft impacted in a 45-degree dive, traveling in excess of 500 knots. Although Flight Lead did not observe an ejection attempt, investigation revealed that the backseater did eject — but apparently out of the H-7 seat envelope. Apparently the pilot made no attempt to eject.

It would pay all of us to review the ejection envelope for various dive angles and airspeeds in the airplane we fly. If you're not familiar with it now, the information you come up with may surprise you. In the case above, with an H-7 seat and two-second crewmember reaction time, from a 45-degree dive at 500 knots you would need approximately 3000 feet for completion of the ejection sequence. And that doesn't account for altimeter lag! !

(Adapted from CROSSFEED)



AW, C'MON GUYS! DEPARTMENT. Explosive Accident — Type Aircraft, F-4. "After completion of mission, navigator inadvertently pulled canopy jettison handle while attempting to open the canopy. Canopy shattered upon impact with ramp."

HERE'S YOUR CHANCE NAME THE NEW AIR FORCE SAFETY MAGAZINE

Beginning with the March 1970 issue, Aerospace Safety, Aerospace Maintenance Safety, and the USAF Nuclear Safety magazines will be consolidated in a single, comprehensive monthly accident-prevention publication. We want YOUR suggestions for a name for the new magazine.

I suggest the title of the new magazine combining Aerospace Safety, Aerospace Maintenance Safety and USAF Nuclear Safety be

MAIL TO EDITOR
AFIAS-E1
NORTON AFB
CA 92409

YOUR NAME_____

ADDRESS_____



"ARE YOU READY?"

Reference "Are You Ready?" *Aerospace Safety* magazine, November 1969.

I wish to personally commend the author of the article "Are You Ready?" I was the Base Disaster Control Officer on the overseas base where the major aircraft accident used as the prime example in the article occurred.

I certainly learned some very valuable lessons and I, too, hope that "some deep, honest study by everyone reading it" will result.

1Lt Roger M. Ashley
2851 Air Base Group
Kelly AFB, Texas

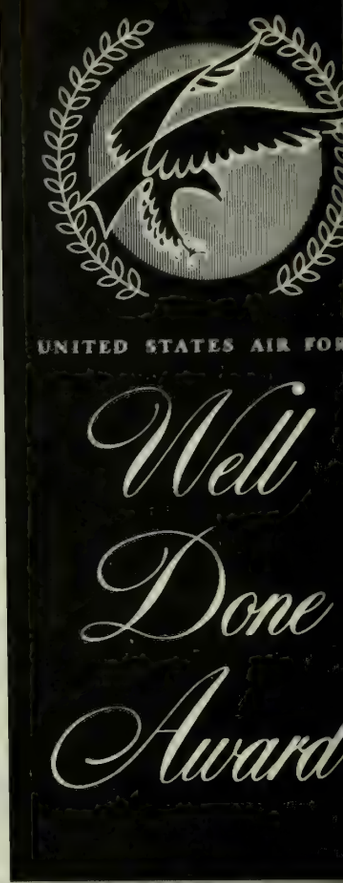
ANGLE OF ATTACK ARTICLES

The *Aerospace Safety* magazine has had some fine articles on angle of attack systems recently ("Aural Alpha" and "What's Your Angle"). I would like to clarify one sentence in the latter article, however, to indicate that alpha is independent of landing gear position and is a function only of the wing configuration. As the author points out, icing (which changes the air foil) can invalidate the indication shown to the pilot.

Gary E. Krier
NASA, Flight Research Center
Edwards, Calif.

In the referenced article, we were talking to the pilot, and landing gear position will affect his presentation of alpha in the cockpit . . . in most airplanes. With fuselage-mounted alpha vanes, we often find that extended landing gear, gear doors and open gear wells change the local flow around the vane in flight, giving an erroneous indication of change when wing angle of attack has not changed.

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performance during

a hazardous situation

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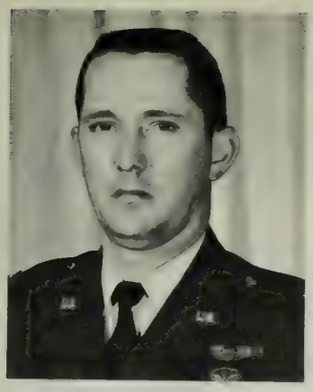
United States Air Force

Accident Prevention

Program.



Colonel Gus Weiser
Pilot



Captain Wendell Adams
Aircraft Commander/IP



MSgt Zigmont W. Dawid
Flight Engineer

551st Airborne Early Warning & Control Wing Otis AFB, Massachusetts

On 5 March 1969 Col Weiser, Capt Adams and MSgt Dawid were departing Goose AB in an EC-121H. Aircraft weight at takeoff was 137,000 pounds. The weather was a 300-foot ceiling with two miles visibility in snow. As the aircraft became airborne, the fire warning circuits for Nr 1 engine activated. Sufficient runway did not remain to abort and a visual scan revealed flames coming from Nr 1 engine. Col Weiser ordered Nr 1 engine feathered; however, the fire continued until the engine fire extinguisher was discharged. Although a three-engine climb was continued, ground clearance remained less than 100 feet due to rising terrain and heavy gross weight. Therefore, Capt Adams directed the flight engineer to start dumping fuel. Captain Adams then notified Goose Tower that they had feathered Nr 1 engine, were declaring an emergency and attempting to climb to a safe altitude. A very slight rate of climb was maintained during the turn dictated by some hills rising into the clouds. Col Weiser and Capt Adams decided to remain VFR below the cloud base of 250 feet, until a weight was reached that would permit a better rate of climb and until radar contact could be established with Goose Approach Control. Takeoff power was maintained on the remaining three engines until the aircraft reached 140 knots, then the throttles were reduced to maximum continuous power.

Just as the Goose AB housing appeared directly ahead, the Nr 3 engine oversped to 3250 RPM. The flight engineer reported he had no governing control over the propeller and was retarding the throttle to try to get the RPM within limits. At idle, the RPM dropped to 2200.

Col Weiser began a shallow left turn toward the field, away from the dependent housing area. Because the aircraft still weighed over 120,000 pounds, level flight could not be maintained on two engines with the flaps in the takeoff position. Captain Adams set maximum power on engines 2 and 4 and directed the flight engineer to place the hydraulic crossover switch to emergency to give backup hydraulic pressure to the flight controls. Capt Adams then began to raise the flaps in small increments to reduce drag. Capt Adams eased the Nr 3 throttle forward to check the manifold pressure at 2900 RPM. At that RPM manifold pressure read 23 inches so it was decided not to feather the engine.

At less than 100 feet above the ground, with the flaps at 20 per cent, Col Weiser was able to maintain level flight at 135 knots, 15 knots below the minimum safe two-engine airspeed. Capt Adams notifed Goose Approach Control that they had lost another engine and requested a direct heading to the nearest runway at Goose. Although only two miles from the runway, neither pilot could see the field because the aircraft was in a depression below the field elevation.

Fuel dumping continued and as weight decreased a slight climb was possible. At one mile the runway was sighted directly ahead. Approximately one-fourth mile from the end of the runway Capt Adams directed the flight engineer to stop dumping fuel. He then placed the gear handle down. The flaps were left at 20 per cent so that gear extension would not be slowed by two systems operating on the hydraulic system at the same time. The gear locked down as the aircraft crossed the runway threshold and Capt Adams immediately placed the flap handle down. The flaps reached the down position at touchdown.

The aircraft was stopped on the runway so that a fire truck could assure the dump chutes had closed properly. The aircraft was still several thousand pounds heavier than the maximum normal landing weght. Investigation revealed material failure of a power recovery turbine hood on Nr 1 engine. This had allowed exhaust flames to start a fire inside the engine cowling, causing extensive damage to the engine area. The propeller governor on Nr 3 engine had failed, necessitating an engine change.

This crew exhibited outstanding teamwork, thorough knowledge of emergency procedures, and quick thinking which no doubt saved their lives, a valuable aircraft, and possibly the lives of some of the residents of the Goose dependent housing area. WELL DONE! ★



I'LL GO TO BAT FOR YOU

TOOTS is my name and I'm interested in your problems. I have been answering questions about Tech Orders and things for the maintenance fellas for years. Now I'll be answering questions for you aircrew guys as well. Write me c/o Editor (AFIAS-E1), Dep IG for Insp and Safety, USAF, Norton AFB, CA 92409.

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UNITED STATES AIR FORCE • MARCH 1970

Aerospace SAFETY

FOR AIRCREWS, MAINTENANCE & SUPPORT TECHNICIANS



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PERSPECTIVE

PAGE 1

Aerospace SAFETY

FOR AIRCREWS, MAINTENANCE & SUPPORT TECHNICIANS

March 1970 AFRP 62-1 Volume 26 Number 3

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HELP WANTED

1. Executive Officer
2. Demonstration Pilot
3. Narrator

by the

USAF THUNDERBIRDS

Applications for executive officer will b accepted until 1 April 1970; for demonstra tion pilot and narrator until 31 July 1970.

Selection of executive officer will be mad by May 1970 with a reporting date in Jun The executive officer must be a Major Lieutenant Colonel with at least 2500 hou total flying time and 2000 hours jet fight time and have completed a combat tour Southeast Asia.

The demonstration pilot must have an a tive federal commission service date no earli than December 31, 1960. A completed comb tour in Southeast Asia and 1000 hours rated jet fighter or jet trainer experience a mandatory.

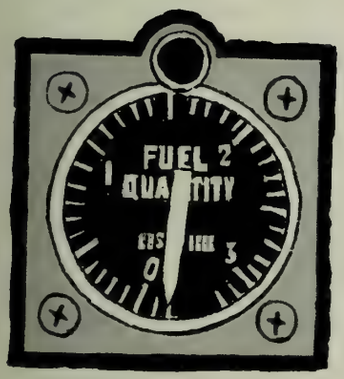
The narrator qualifications are same for the demonstration pilot position. The ne assigned narrator will spend three years w the team — one year as a narrator and t years as a demonstration pilot.

Forward applications through channels w an information copy directly to the Co mander, USAF Air Demonstration Squadr "Thunderbirds", Nellis AFB, Nevada 891 Include the following documents:

- Personal statement expressing desire a reason for applying.
- Resume of civilian educational ba ground.
- Marital status.
- Breakdown of flying experience.
- Copy of AF Form 11.
- A recent 8" x 10" photograph.
- Copies of last five (5) OERs.
- An indorsement by the applicant's mediate commander.

With the exception of the application period which has been revised because heavy show commitments, selections will made in accordance with AFM 36-11, Ch ter 45.





MINIMUM FUEL *then what?*

At least 22 times during 22 months of 1968 and 1969, Air Force pilots ran themselves out of gas. In 13 other reported cases, aircraft engines quit prematurely from fuel starvation caused by maintenance or materiel factors.

The disturbing regularity with which pilot-induced fuel starvation incidents have been happening raised some questions about the circumstances surrounding them. Is one type of aircraft involved more often than others? Do these situations occur on only certain types of flying missions? Who are the pilots involved? Are they new pilots; old pilots?

When you study these fuel starvation mishaps, the answers soon become apparent. And some of them are as disturbing as the frequency and regularity of the problem itself.

Do most of the fuel emergencies occur in single-engine; short endurance airplanes?

No. Twelve of the 22 occurred in airplanes with two or more engines.

Is fuel starvation more prevalent in the fluid, constantly changing environment of a tactical combat mission?

Half of the pilot-involved fuel problems occurred in PACAF. But four of the pilots were not in tacti-

MINIMUM FUEL *then what?*

CONTINUED

cal situations when the trouble occurred. Put another way, two-thirds of the pilot problems occurred during scheduled, controlled training, cross-country and instrument flying or routine, non-combat missions. One was a medevac!

Are the people, the pilots involved, mostly inexperienced?

No. Instructor Pilots were in the airplane on six occasions when poor procedures caused or contributed to fuel starvation. In another, the pilot was a tactical flight leader. In fact, one-third of the incidents involved IPs or flight leaders—people who were well-experienced, above average pilots in their aircraft and mission. Many of the others were far from being neophytes. Not one incident was reported of a solo UPT student running out of fuel.

Do the complex systems of newer aircraft make fuel mismanagement more probable?

Not necessarily. The O-1, O-2, T-33 and C-47 accounted for nine (almost half) of the reported mishaps. When problems occurred in more sophisticated airplanes, they were usually problems identified long ago and briefed repeatedly to all hands:

An F-4 pilot forgot to turn off the external tank switch, trapped 4000 pounds of fuel in the wing tanks, flamed out and ejected six miles from home base.

A B-52 copilot mismanaged the fuel panel, causing an 8000-pound imbalance and leaving only two boost pumps operating for the four engines on one side. The aircraft commander and IP were busy switching seats, missed the descent checklist and didn't notice the error. On leveloff at low altitude, with flaps extended, the high power required to maintain flight overtaxed the capability of the limited fuel system. All four engines on one side flamed out, followed by bailout and loss of the aircraft.

An experienced KC-135 crew landed after four hours of a 50-8 proficiency flight to pick up an IP who was to administer flight checks to the pilot and copilot. Planning to fly to a base 125 miles away for an instrument approach and return to home base, the IP mentally calculated the fuel required and decided they had enough on board. His guesstimate did not allow for the reserve required by AFM 60-16. The IP didn't recognize that they were in a minimum fuel condition when they left the instrument practice base to start home. Their fuel lasted to within two and one-half miles of home base; the flight terminated 640 feet short of the runway overrun.

Several pilots became engrossed in aircraft system malfunctions and ignored rapidly depleting fuel quantity.

F-102 Unsafe gear indication, flamed out waiting for the runway to be foamed. Supervisor of Flying and squadron operations personnel stood by and watched.

A-26 Unsafe gear down indication. Right engine ran out of fuel, aircraft crashed making low passes over the runway at night, while the SOF tried vainly to see if the gear was locked down.

F-106 Pilot noticed a fuel imbalance problem, then a low level light on one side, didn't abort the mission and head for a recovery field until he had flamed out once and got it restarted. When the engine flamed out again he was unable to start it and ejected.

Others, recognizing a fuel problem (either self, materiel or maintenance induced) lost a good opportunity to get to a runway and land by not using sound, well thought out procedures.

An **O-2A** pilot and an **RF-4** crew, both returning from combat missions with full knowledge that they were running short of fuel, accepted traffic delays without saying a word to the control agency about their fuel state. Both aircraft ran out of gas and crashed without reaching a runway.

F-105 Pilot on three mile final after a night mission was told to go around, the runway was closed. The SOF diverted him to a base 80 miles away. The pilot did not declare a fuel emergency at that time or jettison external stores although he was already very low on fuel. Approaching the divert base he didn't ask for a GCA, used incorrect procedures in trying to intercept the TACAN radial to the field. Passing the runway without sighting it, he started a climbing turn, flamed out and ejected.

F-4 Returning to base with less fuel than they should have, the crew was told the runway was closed due to an emergency. They decided they had enough fuel to jettison unexpended ordance, divert to another base and land. But GCI told them there was a tanker in the area, so they abandoned their perfectly workable divert idea, missed the intercept with the tanker, flamed out, ejected.

We could go on and on. Almost every one of the briefs leaves you shaking your head—the medevac pilot who didn't want to offload litter patients at an enroute stop to refuel; the T-37 instructor who took off from a civilian field with only 400 pounds of fuel because he didn't know he could buy fuel there.

There are some among us who just don't pay enough attention to fuel status. For them, and maybe for the rest of us too, a few points need emphasis:

• Bingo fuel means start home—now! If the FAC wants one more pass, tell him you can't.

• On a multi-stop flight, don't press your luck. Take enough time along the way to fill up before you need every last drop in the tanks.

• Be absolutely sure you have fuel switches and selectors in the correct positions. Double check!

• Don't trust the fuel gages down to the last gallon. The calibration tolerance doesn't guarantee you that kind of accuracy. *Compute* your fuel consumption for the planned flight. Recompute along the way and when your flight plan changes.

• Once you've run yourself a little shorter than you planned, tell somebody! Holler "minimum fuel" and don't be bashful about it. Better to explain *that* than a bailout.

• After you've progressed to that stage of the problem, don't ever accept a "Hold east of the field for departing traffic"—or any other kind of traffic delay that jeopardizes a safe landing.

• Finally, treat low fuel state like any other emergency—be very deliberate and careful in your actions and planning. Don't let anyone talk you into chasing after an uncertain plan when you have a sure one in your hip pocket. ★

Maintenance and Materiel got into the fuel starvation act, too—

T-28	Stuck valve.
C-47	Fuel quantity indicators adjusted incorrectly.
T-33	Boost pump inoperative.
C-7A	Faulty fuel quantity indicator.
B-52	Fuel feed valve failure.
F-84F	2000 pounds fuel trapped due to unknown malfunction.
VT-29	Fuel quantity gages improperly calibrated.
B-52	Boost pump inoperative.
A-26	Gear down lock switch malfunctioned.
F-100	Nr 1 and Nr 3 boost pumps failed.
F-104	Unknown component of aircraft or engine failed.
F-106	Right main shutoff valve closed.
F-105	Possibly pumping afterburner fuel through engine without light-off.



And Aero Club!

Overseas:

Replacement of lower half of engine cowl, bottom skin from cargo door to tail cone, one fuselage former, wing attach bolts, engine mount bolts, and nose strut clamps. $750 for parts and $300 for repair.

Pilot attempted to circumnavigate weather and overextended fuel capacity.

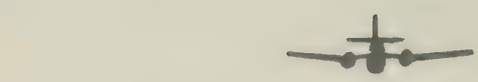
ZI:

Left main gear separated at impact, nose gear collapsed. Prop bent, firewall bent, engine cowl bent and torn, firewall broken. Left door spring, floor panels and stringers buckled from firewall to baggage compartment. All control cables sheared or broken. A $13,700 aircraft damaged beyond economical repair.

Pilot made large errors in flight planning, mixed statute and nautical miles in computations. Mileage, timing and fuel consumption figures were higher than planned. Changed destination in flight too late to complete the flight safely, ran out of fuel.

Pilot had not been properly instructed by the club in cross-country flight planning or procedures. Clearing authority failed to discover that the flight could not be completed as planned.

Landing at marginal strips, airlift pilots frequently encounter a problem common to all aircraft types



perspective

Col J. A. Talbot, Directorate of Aerospace Safety

In the routine accomplishment of their mission, our brethren in the salt water Navy perform the carrier landing. That they do so successfully never fails to amaze me. I am impressed by both their airmanship and the ruggedness of Navy landing gears.

I am equally impressed by the skill of Air Force pilots who fly in and out of marginal airfields in SEA. The threshold environment offered by some of these fields is remarkably like that presented to the Navy pilot on an approach to a carrier; except that the USAF pilot approaching a Type 1 strip has no "meatball" and no Landing Signal Officer to assist him, as does the Navy pilot. In fact, he may have no landing aid at all—no ILS, no GCA, no VASI, no nothing. Consequently, accidents occur as the result of short, long and hard landings.

Here are some classic examples. A highly qualified pilot in a C-7 made an approach to a short air strip in I Corps. His left gear hit 18 inches below the lip of the threshold and sheared. The aircraft sustained major damage.

Circumstances. This airfield is classified as Type 1 for the C-7. (Tactical Aerodrome Directory definition: "Operations will be marginal. . . .) The runway is graded dirt, 1000 feet long, terminating at each end with a sheer 30 foot riverbank. The ends of what was considered the "usable" runway were marked by white painted panels of PSP. No weather information was available. The pilot had made 24 successful landings at this field including two that day. However, on this particular approach, NEITHER HE NOR HIS COPILOT realized they were too low.

Example number two.

A C-123 pilot made a relatively flat approach into a dirt strip in the Central Highlands and hit short of the overrun in a nose high attitude. The right gear sheared followed by progressive structural failure and fire. This was the fourth such accident at this field.

Circumstances. The airfield, classified as Tpye 1 for the C-123, was located on a knoll 800 feet above the surrounding terrain with steep dropoffs on all sides. Its 2000-foo length was marked with PSP panels that were covered with an accumulation of dust which rendered them difficult to see at any great distance. Lack of vegetation and runway surfacing resulted in blending of the dirt runway with the surrounding area, which made determination of the exact boundaries extremely difficult. The profile of this airfield and the sur



Tire marks indicate where wrecked C-7 (upper left) touched down on lip of slope. Runway is 1100 feet long, white rectangle on right side is 200 foot marker.

rounding terrain produce downdrafts and windshears intermittently. No weather information was available.

Example number three. (This one is back here in the real world just to prove it doesn't all happen in SEA.)

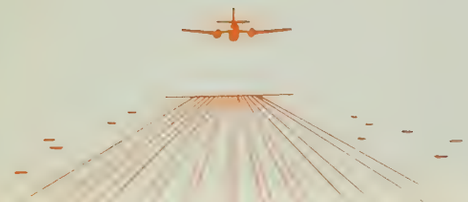
A very highly qualified (although relatively inexperienced) C-124 pilot made a VFR approach into a 5000-foot runway located in a large metropolitan area. During roundout, his right main gear struck a concrete retaining wall three and one-half feet below the lip and some 80 feet short of the threshold. The right gear stayed there, but the aircraft continued some 2500 feet down the runway and stopped 25 feet off to one side.

Circumstances. Although there are no tactical classifications for stateside aerodromes, 5000 feet in a C-124 is, from experience, not something you would want to tackle after six months of CAT III layoff. There was only an 80-foot overrun. The approach was made over a heavily populated area 150 feet lower than the runway, and the far end of the field offered similar abrupt conditions; in other words, you were in trouble in either direction if you didn't stay on the runway! Voice communication was adequate but there were no landing approach aids (no IFR approach procedure). As in example number one, both pilots felt no qualms about a successful landing up to the point when the gear made contact with the concrete wall.

Some similarities are apparent in these three PILOT FACTOR accidents: All three runways were located *above* the surrounding terrain with virtually no threshold area to provide cues during the roundout or flare. In all three cases the pilots realized that landing long would be drastic, if not catastrophic! And there were no approach aids such as ILS, GCA or VASI. We know that, in at least two cases, the pilots did not recognize they were in serious trouble!!

It would seem then, that we have physiological, psychological and environmental considerations which, in various combinations, *produced* "pilot factor" accidents. (Note, I didn't say "resulted in".) And, it is very probable that if we don't provide pilots more education and better facilities, we will produce exactly the same type accidents in the future. So, in the interests of education, here are some comments you might remember when tackling a short field situation.

The technique for determining height and distance on an approach to an elevated runway is not the same as that used over flat terrain. Normally, after receiving the local altimeter setting, the pilot enters the pattern (or crosses some prescribed fix) at a pre-determined altitude and from that point on,



perspective

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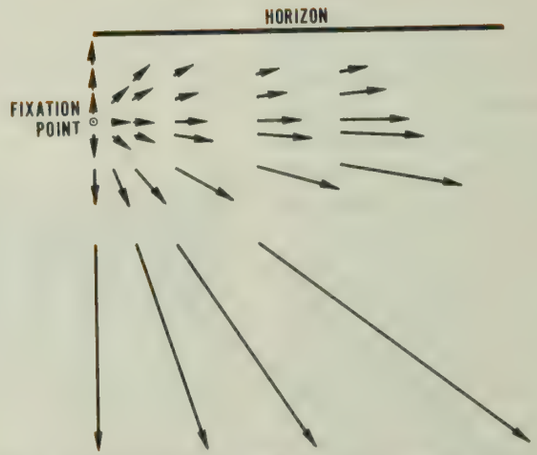
throughout base and final, he makes numerous evaluations of his height, airspeed, track and the runway perspective, to arrive at a flight profile which will get his rollers on the landing end of the runway.

The method and direction of these eyeball evaluations change throughout the approach. Direct eye references predominate between the ground and the instruments in the pattern and at the beginning of final approach. Then peripheral references are added as the aircraft approaches the runway. Just prior to and during the flare, the precision demanded in arriving at the optimum alignment/attitude combination uses most of the pilot's direct references; rate of sink or height determinations are to a great extent, evaluations of peripheral perceptions. Once over the landing end of the runway, alignment and height/rate of sink determinations become the result of direct references, with negligible inputs expected from peripheral sources.

So, what's so different about making an approach to an elevated runway? First of all, there is a certain dependence on the altimeter. Knowing that field elevation and the surrounding terrain are the same inspires in the pilot a certain amount of confidence that he is a definite number of feet above the runway. When an approach is being made to an elevated runway, this relationship is lost, or is at best only an approximation.

As the aircraft continues down final, the pilot is cueing off the ground under his track, taking each cue as he moves forward, comparing it to the one(s) previous, and from these estimating relative height, direction and forward speed. Because of his past experience, he uses the runway perspective as a strong cue in the judgment of distance, etc. Perspective combines size, shape, and slant, compounded with other cues, and provides one of the most important depth-judgment factors. Additionally, motion parallax—the relative movement of objects in the visual field—can be used to estimate touchdown distance. As the pilot concentrates on the touchdown point, assuming the aircraft is on a constant glide slope, this touchdown point will appear stationary. All other objects in the visual field will be spreading out from this point at different velocities. While this pattern will be constant as the aircraft descends, the apparent velocity will increase inversely to his distance from his primary visual reference: the touchdown point. From this information alone, most pilots are able to pretty well estimate touchdown distance during landing.

However, during an approach to an escarpment or bluff, the objects



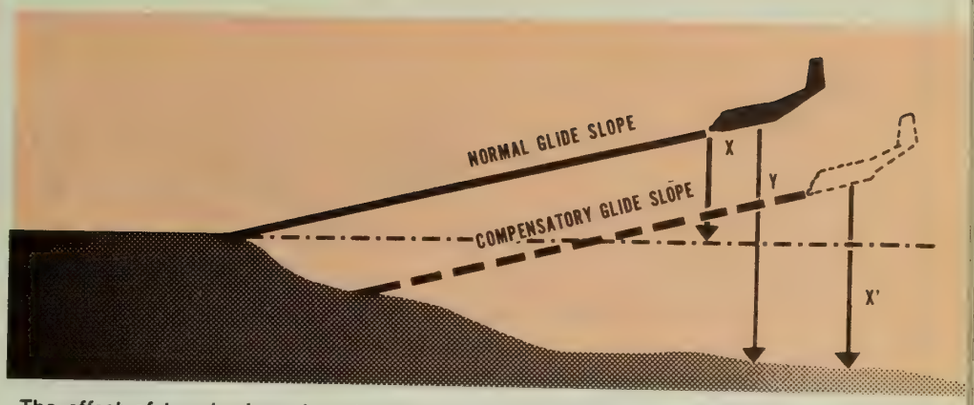
The pattern of apparent displacement of objects in the field of view for a 20% glide slope toward the fixation point. The tails of the arrows represent the initial point of the retina. The direction and magnitude of the apparent motion are represented by the length and direction of the arrows.

on the ground do not spread out at the rate they do normally because the height/distance relationship is different. And, as the pilot nears the face of the hill it seems to expand tremendously, to the extent that his speed *seems* to be overly high. This tends to explain why pilots, approaching such an embankment, suddenly perceive a high relative forward speed and prematurely chop the power and hit short.

There is a technique that can be employed in situations like this. First of all, disregard the altimeter except for rather gross determinations. (This is a VFR approach after all, remember?) Secondly, disregard the terrain for cue estimations, except of course, to stay above it, or to calculate an approximate distance out on final.

Now for the DO's. ESTABLISH A RUNWAY PERSPECTIVE! You know how the runway should look on final. Once you get to this point, cue on it, and it alone. From here on in, it is a matter of adjusting power and attitude to keep this relationship and perspective constant until you flare. Remember that motion parallax as an aid in determining height/distance isn't reliable until *after* elevated ground the runway) is reached. It is only then that velocity cues become valid and adjustments can be made for touchdown. Prior to this time, your trust should be in the angle of attack indicator, (or airspeed if AOA not installed), not in what you think your eyes are telling you from cues outside the cockpit.

Another DO, is to establish a landing point sufficiently far down the active to take care of small miscalculations and at the same time have room to bring the plane to a stop. While I'll admit this is easier



The effect of terrain downslope in the runway approach on aircraft glide slope. With a terrain downslope, the pilot will believe the aircraft to be on low, flat approach, and there is a tendency to land short of the runway.

to say than do, the fact remains that most short landings occur because the pilot attempted to use ALL the available runway and miscalculated.

Another educational goody I advocate is computation of landing roll; both without and with reverse, if this feature is available. This is simply a confidence maneuver. It is this information that proves the landing strip is within the aircraft's capabilities; that you don't HAVE to use every inch of the runway; that there should be no great concern about running off the far end of the strip; and, you will know when you must make your decision to go around if you fail to touch down where you had planned.

From a pilot's standpoint, the most important aspect of the educational process is in the *doing* part. It is all well and good to "do as I say," but when it comes to the "do as I do" its an altogether different thing. Practice is the only way that one can become familiar enough with his equipment to have absolute confidence that it will perform as advertised.

At a certain STOL airspeed how much margin do you have before the bird stalls? How much airspeed do you lose when the props go to high RPM? How comfortable do you feel with the angle-of-attack indicator right on the mark? How much power does it take to reestablish this angle once it drops low? And ultimately, how successful are you at touching the main gear on your aiming point on ALL landings?

If 100 per cent, you're OK. If not, practice some more—or stay away from the short fields! If you are having trouble, carefully review the Dash 1 and have one of the pros ride with you. He may offer a valuable tip you overlooked.

One of the greatest psychological barriers to successful short field landings is preoccupation with the apparent shortness of the runway. It is this factor that induces pilots to resort to extreme measures such as flat approaches, end of runway touchdowns, chopping the power while still airborne, etc., etc., etc. It is this type of preoccupation that inhibits concentration on the desired goal, namely flying the bird to a precise aiming point at the proper attitude and airspeed. The pilot who has practiced won't have this psychological barrier to contend with because he will know he can hit reasonably close to his aiming point, and once there, have every assurance that he can bring the aircraft to a stop in the runway remaining (assuming, of course,



perspective

CONTINUED

that complacency doesn't take over).

What else can be done to improve the pilot's lot? We can recognize that airfields constructed on higher terrain are tough to joust with and improve them at relatively little expense. For exampe, in two of the cases described in this article, there was a definite lack of color contrast between the runway and the surrounding area. If the pilot has trouble determining WHAT is the runway, he is certainly going to have trouble ascertaining his position in relation to it and also determining an aiming point. Would a couple of hundred feet of asphalt, penaprime or even crude oil help?

Finally, I'd like to return to a previous paragraph, where I suggested that a runway perspective must be established. This can be complicated. Length, width, surrounding terrain features and runway slope create illusions that defy the physiological and perceptual abilities of the guy we're trying to help: the pilot. (An illusory situation may affect both pilots, only one, or may not affect one individual the same way every time.)

Naturally, if there is an illusion, the pilot's runway perspective is going to be false. So is his approach angle and so also will be his aiming point.

The School of Aviation Medicine in their Technical Report 67-28 referred to this very problem when they stated: "Because of this extremely complicated stimulus (overall runway perspective), past experience-knowledge situation, a pilot would be expected to make poorer approaches and landings on unfamiliar airfields. This would be particularly true if the slant-shape-distance-size relationships were drastically *different* from fields with which he had had previous experience."

We can greatly assist the pilot by providing him with a visual glide slope. A means whereby he can establish himself on final the same way he does on an ILS, except that instead of reading his position off an instrument in the cockpit, he looks at the glide slope itself. This principle isn't new or revolutionary by any means because it has been used by the Navy for years aboard carriers in the form of the "meatball." The Air Force has installed the VASI system which uses a similar principle.

There are several portable VASI type landing aids designed for use in field environments and powered by batteries. And if these are too expensive (a kind of silly question when we consider the cost of four C-123s which were destroyed at a single field for lack of one) there is the genuine economy model known to the Navy as the POMOLA (poor man's optical landing aid) which can be constructed out of used packing crates and works just peachy. Even it can be deluxed a bit by covering it with reflective tape or paint. Shine a light on it — and it'll work at night too.

In winding up this article, I'd like to quote from a study conducted by Drs. Conrad L. Kraft and Charles L. Elworth of the Boeing Company entitled "Night Visual Approaches:"

"Our major emphasis is on the visual aspects of landing approaches and research results have convinced us that at least some of the 'pilot error' ascribed to approach accidents is based on *incorrect assumptions concerning normal human visual abilities.*" (Note: Author's *italics.*) In other words, for the pilot faced with an elevated and poorly marked runway of minimum length, the *visual task* may easily exceed his normal *visual ability.* Since the pilot's eye is the only means by which he can make this judgment or estimation of distance versus speed versus altitude versus power, it is apparent that someone, somewhere, sometime, is going to err; and all because the variables are more than he can cope with.

The answer lies in reducing the judgments necessary and providing him with a definite line to fly by means of some approach aid in conjunction with a charted airspeed or calibrated angle-of-attack indicator. Then, and only then, will he know exactly where he is on approach and be able to consistently touch down within a few feet of his aiming point ★

ACKNOWLEDGMENTS:

1. School of Aviation Medicine Technical Report 67-28.

2. Conrad Kraft and Charles El worth, "Night Visual Approaches" Boeing Airliner, March-April 1969

3. Carl Brown, "Fresh Approach," Air Facts, December 1969.

those terrible taxi tangles

WHETHER YOU'RE PILOT OR GROUNDCREW DON'T GET CAUGHT IN . . .

In nearly all taxi accidents there are circumstances over which the operator has little or no control. Such things as inadequate airfield lighting, poorly marked or confusing taxi lines, taxi lines that were intended for an F-105 being used by a C-130, or just plain poor housekeeping by Maintenance. In the latter instance, the maintenance men can set the stage for an accident by positioning AGE too close to where the aircraft is going to be parked, or by not properly clearing the area before giving the pilot the All Clear to Taxi signal.

Here are some prime examples of what we mean.

• A C-124 leaving a parking spot made a 180 degree, sharp right turn in a congested area and dragged the left wing over a B-2 stand. Damage to the wing and aileron necessitated sheet metal and fiber glass repair. Ground crew personnel directing the operation believed the wing would clear the B-2 stand. The copilot asked the pilot if it would clear and was given an affirmative. The scanner said nothing until impact. Obviously a case of misjudgment on the part of all concerned.

• An F-4 departing a parking spot, ran over a LOX cart which scraped and dented the wing. Again a case of misjudgment by both pilot and ground crew.

• A T-33, while being directed into a parking spot by the ground crew, wrinkled its wing tip on an MD-3. In this instance equipment had been prepositioned, setting the stage for a taxi accident. Same old story, both pilot and ground crew misjudged the distance between the wing tip and the MD-3.

• A C-130 pilot had to use reverse thrust to maneuver out of a revetment. Even though the loadmaster was monitoring the backing operation, they backed too far, struck another parked aircraft which damaged the C-130's right wing and aileron. This one happened without the aid of the ground crew.

• Another C-130 taxiing in the rain on a poorly lit taxiway strayed some 72 feet left of the centerline. The left wing struck the rotor housing of a parked UH-1B. The C-130's left wing and anti-icing ducts sustained considerable damage.

AFR 60-11 requires annual testing of ground crews who taxi or otherwise operate aircraft on the ground. At the time of the regular ground handling test, supervisors should insure that all their personnel are familiar with the different aircraft configurations they would encounter. An example of different configurations is the swept wing and how it seems to grow or get longer in a turn, or the flex wing that's high when empty and low when full of fuel.

Operator factor (pilot, crew chief, engine specialist) is commonly present in taxi accidents. His perspective from the cockpit may give him false information about wingtip or tail clearance. To prevent this type of accident:

• Stop the aircraft and don't move it again unless you are sure of clearance.

• If you can't see the centerline, stop until you get wing walkers.

• If necessary, send a crewmember to check clearance.

As for ground handlers, anytime a wing tip hits another object, AFR 60-11 has probably been violated. Added precautions should be taken when handling different types of aircraft. If the lines are painted for a fighter, don't try to park a C-141 there, until you are absolutely sure how much space the big bird requires. Also don't get ahead of yourself by prepositioning AGE, where the incoming bird might hit it. A little forethought and planning might save you time and embarrassment. If at any time there is the slightest doubt about the clearance, **stop the operation.**

Nobody wants to contribute material for a continuation of this story. If aircrews and ground crews will work together, those terrible taxi tangles can be eliminated. ★

experts talk about the

In this fast-moving age of rockets and jets we are sometimes inclined to overlook the reciprocating engines, so here is some help for you round engine flyers and fixers.

BACKFIRING

The C-124 was past the abort point on the runway when trouble developed. Parts of the aircraft and engines were found scattered along the runway starting at the 9000 foot marker. Witnesses later said that one or more engines were either backfiring or afterfiring shortly after full power was applied.

Most pilots and maintenance crews have had experience with engine backfiring in one form or another. It is defined quite simply as a lean mixture seeking the missing element, fuel, which is available at some source in the induction system from the combustion chamber back to the carburetor screen. This definition is clearly the opposite of afterfiring which is defined as a rich mixture seeking the missing element, air, and then firing. The sound of each may be the same and both can produce vibration. However, a sudden drop in torque pressure, coupled with an increase in manifold pressure and carburetor air temperature, is a positive indication of backfiring.

Backfiring is a symptom of engine malfunction, not a cause, so if you fly or maintain round engines, it is important for you to be able to recognize backfiring. You should also know that usually the first backfire is enough to damage engine parts and either cause an immediate failure or a failure in a minimum of time. So any history of backfiring is a clear warning that the engine is being robbed of its power-producing capability.

Pre-ignition is very closely associated with, and generally causes, backfires. Anything which allows combustion at the wrong time in relation to intake valve position creates a backfiring condition. Such mechanical deficiencies as improperly adjusted valves, improper ignition and incorrectly adjusted idle mixture lead to backfiring. Materiel failure of valves, valve seats, rocker arms, push rods, and other induction system components contributes to backfiring.

Aside from immediate power loss, the effects of backfiring may reach back into the induction system, damaging parts, or even farther back into accessory gears, rods, bearings and propeller shafts. So just correcting the cause of back firing is not enough. The maintenance man must also thoroughly inspect for damage. Before the engine is released it must have the equivalent of a periodic inspection plus the appropriate steps of engine conditioning.

The seriousness of backfiring cannot be overstressed. It is up to the flight crew to report backfiring engines, and it is up to the maintenance crews to eliminate the causes and results of backfirings.

OVERBOOST/UNDERBOOST

Studies conducted at SAAMA show that hundreds of engine failures occur at flight altitude when the throttle is retarded to set up cruise. Generally, this is not the fault of the aircrew, but the result of a failure on the part of some previous pilot to report an overboost. There are conditions which lead to overboost and most pilots have been involved with them. Trouble comes when the engine appears to be OK, the pilot neglects to report the overboost and the next guy reaps the harvest.

Engines returned to the depot show the results of overboost in cracked cylinders, stretched studs, twisted rods and burned valves, but—and this is important—the paperwork with the engine does not mention anything about an overboost.

There are specific tests and inspections for engines subjected to overboost that are not used in normal overhaul procedures. So if the overboost is not reported, normal overhaul procedures are used and overstressed parts are mixed with others and end up in another engine. Now we have an engine starting life with a sick part. Nobody will condemn you for reporting an overboost—so why jeopardize someone else by not reporting it?

Underboosting can be as bad as overboosting. Engines were built and designed to operate within a certain environmental range. Good reliability depends on sound operating practices and techniques. Underboosting occurs when the combustion pressures do not equal or exceed the centrifugal and inertial forces generated by crankshaft speed. This condition results in reverse forces being applied to the piston pins and bosses, master rod bearings, and knuckle pins. In addition, piston ring flutter may be

se round engines

G. F. Heins, SAAMA
Kelly AFB, Texas

induced. These reverse forces can occur under most flight conditions but are more prevalent during descent, when the governor is holding constant RPM and the throttle is retarded to the point where gaseous pressure falls below centrifugal and inertial forces of the rod and piston mass.

After much analysis and compromise of the variables such as RPM, altitude, carburetor air temperature, fuel/air ratio, that affect BMEP, a simple solution has been arrived at to prevent underboost. Manifold pressure has been determined as the criterion and all a pilot has to do to prevent underboost is to maintain approximately one inch of manifold pressure for each 100 RPM.

So pilots, keep the pressure on to stop underboosts and watch the red lines to stop overboosts. ★



RIGHT: What goes on under that cowling is of vital importance to you.



FAR RIGHT: Engine starts are common source of backfiring. What happened to the engine?



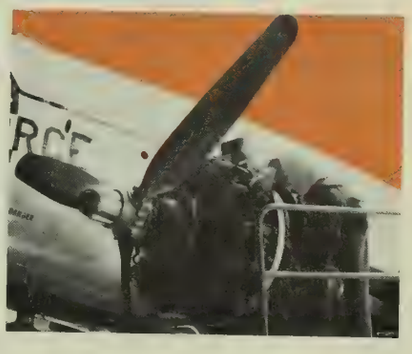


Cylinder failures have plagued the R-2800 engine, so read what causes them.

Even on the old C-47, engine maintenance must be truly professional.



ABOVE: A clean oil system is vital to engines, extra care is needed under these conditions.



RIGHT: Aircrews must report all abnormal engine conditions to keep the next guy flying.

THE I.P.I.S. APPROACH

By the USAF Instrument Pilot Instructor School, (ATC) Randolph AFB, Texas

WEATHER BELOW MINIMA

Q When the weather at my destination is below minimums for the type of approach I request, will I be informed of this fact?

A Not directly. The controller will give you the weather anytime the ceiling is reported below 1000 feet or below the highest circling minimum, whichever is greater, or when the visibility is reported less than three miles. He is *not* required to inform you that the weather is below minimums for the approach requested. With the conversion to TERPs criteria, a controller can no longer be expected to provide this information. Consider the following: There are 115 different military aircraft listed by category in FLIP. Using Randolph as an example, there are six JAL procedures, five AL procedures, and minima for four ASR/PAR procedures published. There are 54 separate minima published to encompass these procedures. A controller would first have to find your aircraft category, then apply it to one of the 54 minima listed, recheck the weather as it probably would have changed, recheck the category to be sure, and on, and on . . . It's just not feasible and not his responsibility. It's the pilot's responsibility to determine if the weather is below minimums for the approach requested.

DD-175 TACAN IAF

Q On the DD-175, when filing to a TACAN IAF that has a name, can I just enter the name of the IAF as the last entry in my route of flight?

A FLIP Planning, Section II, paragraph 113c, states that TACAN IAFs will be clearly identified by TACAN identifier, radial, and DME, e.g., BAL 195/30.

REPORTED CEILING

Q If the ceiling at Podunk AFB is reported as 200 feet overcast, could it possibly be lower than 200 feet?

A You bet! Sky conditions and ceilings are reported in hundreds of feet; therefore, the ceiling in your question may be anywhere between 150 and 249 feet and still be reported as 200 feet. Another point to consider is that the ceiling may not have been measured in the approach zone, the area you are most concerned about. Still another consideration is that ceilings are rarely uniform, or exactly the same height over a given area. More often they are ragged and can vary considerably from one area to another.

RVR vs PV

Q If RVR (Runway Visual Range) for an approach is above minimums but PV (Prevailing Visibility) is below minimums, can I make an approach?

A RVR is the controlling visibility if reported. If PV is below minimums and RVR is above you may start an approach, but only a straight-in to the runway for which the RVR is reported.

HAA and HAT

As you have probably noticed in the IFR Supplement and in the high and low altitude terminal charts, Height Above Touchdown (HAT) is now defined as the height of the DH or MDA above the highest runway elevation in the touchdown zone and will be published in conjunction with *all* straight-in minima. Height Above Airport (HAA) is defined as the height of the MDA above the published airport elevation, and will be published in conjunction with all circling minima.

Previously HAT was used only in conjunction with precision minima and HAA with all non-precision minima. Now the pilot making a straight-in approach, either precision or non-precision, will know his height above the runway he is landing on at DH or MDA. This is more meaningful to the pilot as there can be a considerable difference between airport elevation and touchdown zone elevation. Remember, airport elevation is the highest elevation on any usable landing surface on the aerodrome while touchdown zone elevation is the highest elevation in the first 300 feet of the particular runway in question.

Some procedures have been converted, and all should be sometime in the future.

RADAR BEACON PROCEDURES

How well are you up on the new Radar Beacon Transponder Codes? Try these questions:

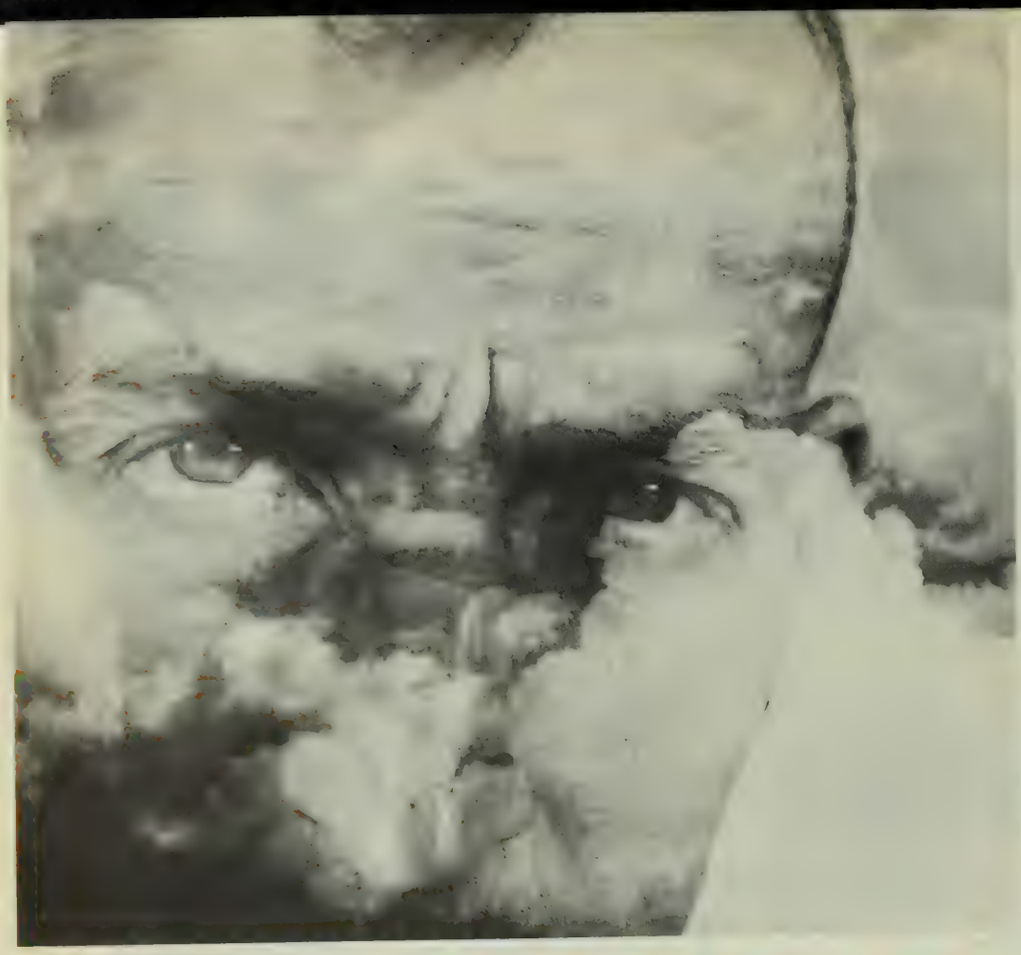
1. Is Mode 3 Code 0600 used for VFR or VFR conditions on top when you cancel your IFR flight plan and are below 10,000 feet?
2. With radio failure should you squawk Mode 3 Code 7700?

If you answered either of the above YES, you're living in the past and should check FLIP Section II, paragraph IIL, "Radar Beacon Procedures."

RADAR APPROACH PROCEDURES

Two recent changes in FAA air traffic controller radar procedures align civil procedures with USAF procedures. The first change is related to the lost communications time interval while on vector to final approach. Under previous controller procedures, the interval for execution of lost communication procedures during vector to final was determined locally with no maximum limit. The controller is now required to "Advise the pilot that if radio communications are lost for a specified time interval (not more than one minute) on vector to final approach, . . ." he will proceed with lost communication instructions.

The second change concerns precision radar approaches. The civil controller is now required to inform USAF and USN aircraft when the aircraft reaches Decision Height (or minimum altitude on those approaches not yet converted by TERPs). This requirement previously existed only for military controllers. ★



IS IT WORTH IT?

some people will bet on an inside straight

Lt Col Robert H. Bonner, USAF, MC, Directorate of Aerospace Safety

New Year's Eve. The aircraft was returning to home base after a night airlift mission. The weather at home was lousy; ceiling 300 feet variable, visibility one mile and variable with light rain and fog. After a 12-hour round robin, with several stops, the pilot was making a straight-in ILS approach because GCA was inoperative. (All three individuals aboard had events planned for later that evening at their home station. At their last stop, the pilot called his command post duty officer and ad vised him he was going to ge home if at all possible, in spite o the weather.)

At three miles from the outer marker, the aircraft was cleare to tower frequency. The tower wa

contacted at the outer marker and the aircraft was cleared for landing after reporting wheels down. The crew called "inner marker" and seconds later the aircraft crashed into 50-foot high trees in a wings level attitude, three-fourths of a mile short and 2200 feet left of the runway. The aircraft was destroyed; all occupants were killed. The final evaluation of this accident determined the cause to be pilot's decision to descend below published ILS minimums and to continue the approach without visual contact with the ground.

What made an experienced aircrew violate minimums? An emergency at home? No. Pressing mission requirements? No. Experience in flying instruments? Perhaps. Wanting to get home in time for a party? Probably. Get-homeitis? Definitely!

On the return leg of a flight the aircrew received the existing weather at their home base as being 200 feet overcast with two miles visibility and fog. A 30-minute forecast predicted 400 feet overcast with five miles visibility and ground fog. The crew decided to attempt a precision radar approach to landing. A normal enroute descent was made and initial contact with the home base RAPCON revealed that the local weather was below GCA minimums and that the only available approach was ILS. (The ILS equipment aboard the aircraft was known to be defective and was noted as such in the aircraft Form 781.)

After some hesitation and crewmember discussion concerning the malfunctioning ILS equipment, the crew advised RAPCON that they would try an ILS approach and requested radar vectors to the ILS localizer. Radar vectoring placed the aircraft on ILS centerline at 1500 feet and nine miles out in a landing configuration. Following glide slope information presented by the malfunctioning equipment, the crew began a premature descent to landing. The aircraft crossed the radar five mile fix well below the 1400 feet listed in the letdown plate. The crew continued the descent and were surprised when the aircraft struck the water four and one-half miles short of the runway.

What caused this crew to attempt an instrument landing in marginal weather with malfunctioning equipment rather than land at their alternate? Only the aircrew really know. It certainly wasn't any pressing emergency at home. There was no inflight emergency. We can only suppose that for some reason, valid or not, this crew decided to throw common sense to the winds and then attempted a procedure recognized as unsafe. Another case of get-homeitis?

An aircraft had been on a cross-country day-night evaluation and training mission. The weather briefing before the flight forecast a severe weather area through their intended route. The flight to the west coast was uneventful. The crew refueled, ate and started home. Although the severe weather forecast was valid for this leg, the crew failed to get an updated weather briefing prior to their return flight. All went well until the aircraft was over Colorado, then the crew saw thunderstorms in front of the aircraft and requested a climb to flight level 410, which was granted by Denver center. After leveling at FL 410, the crew was advised that the severe weather area was too large for radar vectoring around it. The tops were reported varying from FL 400 to 450. The crew requested FL 430 which was granted.

Initially, they were on top of all clouds but the aircraft soon penetrated a cirrus layer. Denver Center reported that the area ahead did not look "real good." Airspeed was reduced to turbulent air penetration speed and all anti-ice devices were turned on. FL 430 could not be maintained, due to turbulence, and a slow descent was begun. Turbulence increased and control became more difficult. Suddenly, a severe jolt was felt in the aircraft and both engines flamed out simultaneously. Air Traffic Control was advised of the situation and that the aircraft was descending.

During descent, turbulence, lightning, hail and rain increased to the point where the aircraft was under only marginal control. Multiple airstarts were attempted from 31,000 to 15,000 feet without success. At 15,000 feet, fire was observed coming from the Nr 1 engine. It went out after the IP pulled the "fire pull" handle. At 10,000 feet, they momentarily broke out of the clouds and saw a small hole through which they could see ground lights. The aircraft was maneuvered through the hole and broke out in heavy rain at 5000 feet.

By this time, the batteries were dead and the flight instruments were lighted by a crewmember shining his flashlight on the instrument panel. Occasional flashes of lightning provided the only illumination from outside. The IP



established a glide which would enable crash landing on a highway, but because of a car on the road, the landing had to be made in a field and the aircraft was destroyed.

Why did this experienced crew elect to continue their mission in severe weather rather than turn around and find an area of more suitable weather? Overconfidence in radar vectoring around the worst cells? Perhaps. Pressing demands at the desk job the next day? Could be. Looking forward to a warm, comfortable bed at home? Possibly. Get-homeitis? Yes!

Man is a complex animal not only physically but psychologically. The above three cases, which occurred in 1969, certainly testify to that! In all three examples, the individuals were known to be intelligent, capable, well-trained, and professional in their approach to flying. Yet they elected to continue flight under conditions which their training, experience, and common sense should have told them were unnecessarily dangerous. What reasons could be so overwhelming to cause professionals to throw caution to the wind? At the risk of oversimplification, let's now consider some possible answers to this question.

All of us have had reasons for wanting to get to a destination. For example, many of us have a desk job which is waiting for us when we return from flying. The job could require attendance at meetings and probably deals with a lot of suspense correspondence. Could the fact that you were scheduled to brief a general officer the next morning motivate you to penetrate a thunderstorm? Could suspense correspondence which must leave your office tomorrow cause you to bust minimums? Could attendance at a conference be so important that you would press on in spite of what your common sense told you? I imagine that all of us could answer yes. Our sense of duty involving our "other" job could lead us to commit unsafe acts or more politely "take a calculated risk."

All of us, sometime in our flying career, have been disappointed by not getting home in time for a party or family gathering. Could the desire to attend a party that you had planned and looked forward to for so long cause you to take the calculated risk? This desire obviously played a role in one of the examples discussed. Have we ever done it? Yes, some of us have.

Can overconfidence in our ability as crewmembers let us take a chance? As we approach our destination, we are over water. We know what the minimums are and we know that the water is sea level with no obstructions; so, let's just duck under the clouds and continue our approach VFR. Perhaps we've done this before. This time, it's so dark we can't see the water until we hit it. Ouch! I think we can say that occasionally overconfidence in our ability may allow us to take chances, particularly when we have what we believe is a justifiable reason to press on.

What about our concern over members of our family? Suppose your wife called and said Johnny was admitted to the hospital after eating a bottle of aspirin. His condition is considered serious and your wife is frantic. You must get home! You reason, a father should be with his son when he is seriously ill. What father wouldn't take a little chance, the calculated risk, to be with his ill chid? And so, you press on.

We have shown a problem,



"get-homeitis," and examined the results, aircraft accidents, and now it is time to discuss a solution. What can we do about "get-homeitis?"

Perhaps, the most important thing is for us to admit that it can happen to any of us regardless of how professional we are. Whatever the reason, there will be times in the future when we will be tempted to take the calculated risk.

Suppose each of us were to take a piece of paper and jot down some reasons, other than operational, why we might take a chance. Now, look at these reasons and ask yourself, "Are they really worth it?" Is it worth the risk to penetrate a thunderstorm so you can be with your sick child or wife? Some of you undoubtedly will say yes. But is it, if, as a result your child would be permanently without a father? Can any reason other than inflight emergencies or operational requirements be just cause for taking unnecessary chances? Probably not, if put to the test of logic.

The final step is for us to resolve not to succumb to the temptation of "get-homeitis." Let us act like the professionals we are and admit there are very few times in flying when taking a chance is really justified. Each time we are tempted, we must ask ourselves the question and answer it truthfully, "Is it really worth it?" ★

Toots



is interested in your problems. She spends her time researching questions about Tech Orders and directives. Write her c/o Editor (AFIAS-E1), Dep IG for Insp & Safety, Norton AFB CA 92409.

Dear Toots

Please help settle a difference of opinion concerning the use of small Model JG-40FK tractors for towing T-39 aircraft. The 36M3-series TOs call it a warehouse tug for towing objects weighing up to 4000 pounds, but TO 1T-39A-2-1 shows a drawing of this small tug being used for towing a T-39. I contend that this tug is not heavy enough, nor does it have adequate braking to control the aircraft. Am I correct?

Opinionated

Dear Opie

Seems there's quite a difference between towing aircraft and pulling warehoused objects around. According to a friendly engineer at the AMA, towing tractors designed to tow weights up to 4000 pounds are okay for towing T-39s, full or empty, provided the operator uses good judgment—no quick starts or stops that could damage the gear, keeping the speed down, and having the required man on the brakes in the cockpit.

Toots

Dear Toots

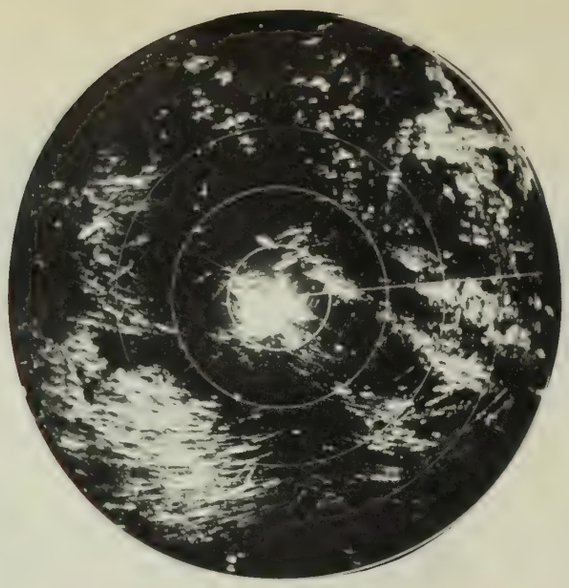
All USAF bases are supposed to have FOD control programs, but I keep reading about stray tools in engines, components, and controls. The British RAF has rigidly controlled minimum tool kits for each job and each specialist working on or around jet engines. Also, a tool kit supervisor accounts for all tools before they operate the engines. Does the USAF have such a tool control program?

Curio Smech

Dear Curio

Major commands publish supplements to the guide lines outlined in AFMs 127-101 and 66-3, as well as AFR 66-33. Tech Order 2J-1-28 also covers tool control, along with other objects, and an FOD inspection entry is required on the AF Form 781A. Past issues of *Aerospace Maintenance Safety* magazine have carried numerous articles covering tool control: use of tool counters, shadow boards, tool checklists, and mechanical tool inventory devices. I don't know how much of our annual multi-million-dollar FOD bill can be charged against stray tools, but it does make you wonder if there's a better way, doesn't it?

Toots



birdstrike

Elwood A. Seaman
Assistant for Natural Resources, Hq, USAF

Dr. Seaman wrote this article shortly after attending the World Conference on Bird Hazards to Aircraft last September at Queen's University, Ontario, Canada. At that meeting biologists, engineers, flying safety specialists and administrators from 19 countries dug into the bird problem by reviewing their research findings and viewpoints.

Since it was impossible to get this article into Aerospace Safety *prior to the fall bird migration period, we held it for publication now—as we approach the spring migration and summer months.*



Too often we do more analyzing than solving problems. Look at the problem of four-pound, and over, birds in North America. That so many aircraft penetrate safely through large flocks of birds is almost unbelievable. There are over 60,000 swans breeding annually in Canada and Alaska and they migrate south for the winter to Chesapeake Bay and Curituck Sound. Over 4.2 million geese and 150,000 Sandhill Cranes migrate to and from various points in Canada and Alaska to many states. That there are not more strikes is amazing.

Birds fly higher than we have previously thought. A snow goose was hit at 25,000 feet! We have learned that many species fly up to 8000 feet; most strikes occur between this level and the ground.

Several species of birds that often weigh over four pounds move about in our air traffic lanes. There are about 760,000 vultures in this country. We had several strikes in 1969, one a fatility at Moody AFB in September when a T-37 windscreen was penetrated by a member of this species. Over 167,000 Great Blue Herons populate our wetlands areas and lakes,

but this species generally flies too low to be hit. Pelicans—population 57,000—are sometimes struck. The water bird known as the cormorant totals about 100,000. Eagles, though getting quite rare, number about 8000. In 1968 a collision with a Golden Eagle cost a pilot his life. A T-37 hit a Sandhill Crane in 1967 with one pilot fatality.

While it is nearly impossible to compute the actual cost attributable to the bird problem, there are some figures available that will provide an idea. The USAF Office of Scientific Research several years ago estimated the annual cost to repair and replace aircraft parts damaged by bird strikes at 10 million dollars. This figure may seem large until we realize that we have lost an average of one aircraft and one pilot a year for the past six years. In addition, there have been several serious injuries. For a good idea of the magnitude of the problem see chart below.

To solve problems in the physical and biological world of science costs lots of dough. We can hardly qualify as big time spenders, having allotted only $80,000 to research on various aspects of the bird problem. But we have produced a short training film (FR 851), and we publish articles on the subject. We belong to several bird hazard committees which do some good. These are: FAA Interagency Bird Hazard Committee; the NATO Countries Bird Hazard Committee; and the two World Conferences on Bird Hazards, Nice, France, in 1963 and Canada, 1969.

WHAT TO DO

The most serious strikes with birds occur in the fall months in the U.S. This is because Mama and Daddy bird are traveling south (usually) with all the kids they raised the past spring and summer. Not all survive the winter, so fewer birds head north in the spring when our next greatest strike time occurs.

Report Bird Flocks Radar could assist more in birdstrike reporting, particularly in migration periods when masses of birds move. The large birds (over four pounds) such as swans, storks, cranes, geese, and some hawks and eagles, are the potential high hazard species. Radar controllers have their eyes busy on other aircraft, but it is possible to spot bird movements on their scopes at the same time, although most radar operators are not trained to observe these particular "bogies." If they were, they could provide a valuable service by reporting large migrating bird flocks in the fall and spring to tower operators for local traffic and directly to aircrews flying through the area. Pilots, when you sight large flocks from the air, report these to the tower.

Feathers A feather file has been developed at the U.S. National Museum specifically for identifying birds from feathers taken from bird-aircraft strikes. It is essential to know the species of bird struck and this service is a quick way to get the answer. *Send feathers* (and/or remains) to either AFOCE (Assistant for Natural Resources) or to Dr John Aldrich, Bureau of Sport Fisheries and Wildlife, Bird Division, U.S. National Museum, Washington, D.C.

Garbage-Trash Dumps If birds such as gulls, crows, pigeons, etc., frequent your airfield because of a nearby garbage or trash dump, there are a couple of things that can be done. If possible, relocate the dump away from the airfield area. If not possible, try to eliminate or cover food with landfill so that birds cannot get to it.

As a last resort, chase the birds from the airfield with a combination of bird dispersal methods such as shotgun shellcrackers, bird distress calls, use of chemical Avitrol (under pest-control or biological supervision), or vehicle-scouting the airfield to disturb birds. No single scare device will work regularly since birds become

	Strikes w/damage	Aborts	Engine ingestion	Engine overhaul/ replace-ments
1965	294	?	109	75
1966	320	20	73	73
1967	379	85	94	*
1968	363	40	88	*

*Although no figures avail, most of these required replacement or overhaul.



habituated to disturbances and come back. A multiple "chasing" effort is necessary and persistence is essential to keep the birds on the move. A warning here is timely: don't scare birds up into the path of a landing or takeoff aircraft!

Bird Control Patrol Airfields that have a rather constant bird visitation, either at migrating time or seasonal, should employ a crew to patrol the airfield. This patrol can apply all known bird scaring and dispersal means as outlined above.

Field Maintenance Grounds on and around an airfield can be altered to discourage bird gathering. A fishing pond is splendid for fishing, but if it happens to attract waterfowl, gulls, blackbirds, etc., which become hazards to aircraft, the pond should be put under bird control management, or drained. Management includes elimination of bird foods (aquatic plants or shoreline seed-bearing plants, etc.), scare devices to move the birds on their way, and removal of fish if fish-eating birds are the problem.

Trees and bushes which provide roosting or cover for birds should be removed if in the immediate area of the airfield.

Grass Cutting To control birds by grass cutting is a big question mark. We used to think that if you cut the grass at a certain height undesirable to the bird species you would discourage birds. It is not that simple. The basic thought was that you controlled insects in the grass by close-cropping and thereby eliminated the food of certain birds. We found out, however, that if you made the grass like a lawn, you *attracted* birds who like short grass! If you let the grass grow long (above six inches) you are apt to have seeds produced that are food for birds and attract mice as well. Then, the mice-eating birds, hawks and owls, come in for their favorite meal! Complex, indeed. The best advice is to have a biologist make the determination locally of what to do about grass height cutting.

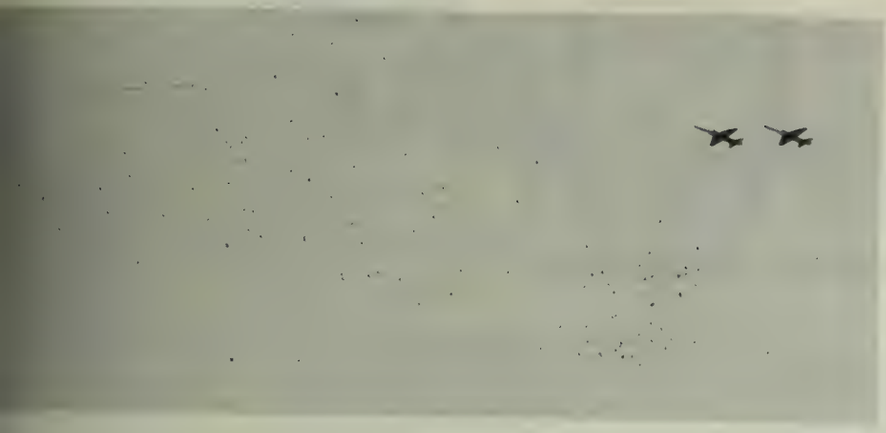
Falcons Falcons are talked about more today because of spectacularly successful uses of them at three European airfields. However, I recommend we do not use falcons, except rarely, for one good reason. The falcon bird species of the world are in bad shape—they may soon be rare birds! In fact, the American Peregrine Falcon, *Falco peregrinus anatum,* is now considered extinct. Why? Most studies indicate rather definitively that DDT has eliminated this bird. Because of this steady decline of the falcon species it is very difficult to get permits from state, federal or provincial fish and wildlife agencies to trap falcons for sport or for uses such as on airfields. This and other reasons discourage the use of this bird-scaring technique.

Control of plants, roosts Control of seed-producing plants, roosts and the like are other jobs the maintenance staff has to accomplish to keep birds away from airfields. If crows, blackbirds, starlings and other such birds have handy roosting trees or bushes on or near the airfield, these birds can be reduced in numbers if you can cut down the roosts. Herbicides can be used for spraying seed-producing shrubs and weeds. (Only persons trained in the use of these chemicals should use them.)

Gravel Using Birds These birds are sometimes attracted to the edges of runways. Mourning doves are a good example of a species of bird which eats small gravel for its crop. To reduce this hazard the gravel strips should be covered

birdstrike

CONTINUED



LEFT: As shattered windshield shows, birds are not soft, feather-light creatures when struck by speeding aircraft.

ABOVE: Birds near flight of T-38s. This jet trainer is currently being retrofitted with bird resistant windshield.

RIGHT: Except for birdproof windshield, pilots' best protection is helmet with visor down.



with an asphaltic oil mix. This is often costly, but bird strikes with large flocks of mourning doves are, too.

Screening and Nest Destruction When birds build nests in flightline hangars three actions should be taken. Use hardware cloth screening where possible, knock out nests as they are constructed (swallows eventually can be discouraged), and when these don't work have your command entomologist apply poisonous feeds to kill birds. Do the latter only under strict control measures.

What Won't Work Occasionally you may hear that flashing lights chase birds. Such devices work only temporarily. Birds become adjusted to flashing lights and actually will perch on them! Stuffed owls in hangars will scare birds only temporarily . . . they soon catch on. Distress cries recorded and played back to scare one species of bird won't work on other species.

OPERATIONS

Here are some good suggestions for Ops and pilots to reduce the number of birdstrikes.

- Reduce airspeed for low level operations during migrating seasons to reduce strike damage.
- Reduce airspeeds and increase rates of climb or descent during terminal activity. Keep enroute aircraft above 10,000 MSL for as much of each leg as possible.
- Restrict night local flying activity during periods of increased bird activity. Proper scheduling could reduce the hazard.
- Fly with your visor down.
- Respond to radioed sightings of birds.
- Provide PIREPS on bird hazards.

UPCOMING ATTACK ON PROBLEM

Birds are here to stay, and no doubt, aircraft, too. Strikes will continue unless some technology is developed to prevent strikes. Research may find the answer.

I believe we need increased funding for research. We need to know more about bird habits—their movements and reasons for certain flying behavior. We need more research in the area of making a safer, bird-proof aircraft.

In the meantime, I feel we need to control birds and adjust ourselves and the aircraft to the situation, as we do to the weather.

The idea of a so-called "zap gun" to knock birds out of the path of aircraft, or whatever research may come up with, is a worthwhile venture. Recently, TWA claimed that keeping their aircraft weather radar turned on while in flight affected birds. This needs close checking.

We are gaining ground on windscreen improvement. Some canopies bounce birds in lieu of cracking or permitting penetration.

We should adopt the Worldwide Conference recommendations about reporting *all* birdstrikes. (As we did in 1968.) Use the addressee group for ALSAFECOM. Cross-feeding of birdstrike incidents and accidents might generate higher level interest in the problem. ★

The conference just had to be worthwhile. Attending were a Mr Bill Bird, *Dr Warren* Flock, *Hans* Blokpoel, *(name of a warbler), Mr Alastair Allcock, Lt Col* Brewer *(name of a blackbird), and to cap-off success we had a Mr. E.* Wright!



REX RILEY

Transient Services Award

LORING AFB	Limestone, Me.
McCLELLAN AFB	Sacramento, Calif.
MAXWELL AFB	Montgomery, Ala.
HAMILTON AFB	Ignacio, Calif.
CHANUTE AFB	Rantoul, Ill.
SCOTT AFB	Belleville, Ill.
RAMEY AFB	Puerto Rico
McCHORD AFB	Tacoma, Wash.
MYRTLE BEACH AFB	Myrtle Beach, S.C.
EGLIN AFB	Valparaiso, Fla.
FORBES AFB	Topeka, Kans.
MATHER AFB	Sacramento, Calif.
LAJES FIELD	Azores
SHEPPARD AFB	Wichita Falls, Tex.
MARCH AFB	Riverside, Calif.
GRISSOM AFB	Peru, Ind.
PERRIN AFB	Sherman, Tex.
CANNON AFB	Clovis, N.M.
HICKAM AFB	Hawaii
LUKE AFB	Phoenix, Ariz.
RANDOLPH AFB	San Antonio, Tex.
ROBINS AFB	Warner Robins, Ga.
TINKER AFB	Oklahoma City, Okla.
WETHERSFIELD AB	England
HILL AFB	Ogden, Utah
YOKOTA AB	Japan
SEYMOUR JOHNSON AFB	Goldsboro, N.C.
ENGLAND AFB	Alexandria, La.
MISAWA AB	Japan
KADENA AB	Okinawa
ELMENDORF AFB	Alaska
PETERSON FIELD	Colorado Springs, Colo.
RAMSTEIN AB	Germany
SHAW AFB	Sumter, S.C.
WRIGHT-PATTERSON AFB	Dayton, Ohio
LITTLE ROCK AFB	Jacksonville, Ark.
TORREJON AB	Spain
TYNDALL AFB	Panama City, Fla.
OFFUTT AFB	Omaha, Nebr.
ITAZUKE AB	Japan
ANDREWS AFB	Washington, D.C.
McCONNELL AFB	Wichita, Kans.
NORTON AFB	San Bernardino, Calif.
BARKSDALE AFB	Shreveport, La.
HOMESTEAD AFB	Homestead, Fla.



TRANSIENT TRAPS

Taxiing the other night after landing at a base in snow country, I asked for taxi directions since I wasn't familiar with the field. Ground Control told me to turn left at the "four-way intersection." I envisioned two taxiways crossing at 90 degrees, and promptly spotted at least two intersections ahead that appeared to satisfy the description. We went through a routine of: "Do I turn here?" — "No, don't turn there . . . now turn."

Next morning, in daylight, I found the four-way intersection was the junction of five taxiways. Confusing.

I'm adding four-way intersections to my list of descriptive terms that won't work for transients. (Some previous entries: Green spots, red barns, brown spots, high way overpasses, the train station and Rosie's Bar.)

Other people have had more serious trouble while taxiing. In the mail this month I read of a C-141 pilot, taxiing at night on an overseas field, when he saw vehicle headlights flashed at him from the side of the taxiway. Although the pilot immediately started braking, the big bird was still moving when it struck the propeller of a dolly-mounted C-130 engine being towed by a tug. Neither the dolly, the engine nor the tug were lighted in a manner that they could be seen by the taxiing pilot. The tug operator had turned off his headlights so they wouldn't shine in the pilot's eyes.

The fire that erupted in the wing of the C-141 was extinguished in 18 minutes. It will take 400 man-hours to repair the damage.

A T-39 pilot turned off the runway after landing at a stateside base, and taxied behind a C-130. The Hercules was performing a max power maintenance engine run. As could be expected, the T-39 pilot had a good deal of trouble maintaining directional control. Before it was all over, the T-39 had tipped over and scraped its left wingtip along the taxiway, and heavy braking had badly scuffed the right tire.

The report on this one stated that the C-130 runup location was the least undesirable location on the airdrome for engine runs. And the base involved is belatedly taking action to restrict traffic on that taxiway when engine runs are being performed. They also said something to their pilots about taxiing behind other aircraft and to their ground crews about the responsibilities of the outside observer during maintenance engine runs. ★

MAINTENANCE briefs



MOISTURE MISTAKE

AN A-37 PILOT, shortly after takeoff, noticed what appeared to be smoke coming from the right interphone panel. Then the right engine fire light came on. The engine was shut down and the aircraft returned to base without incident.

Investigation revealed the fabric cover on the bleed air duct was saturated with water. This caused what appeared to be smoke in the cockpit, but which in reality was vapor. The fire light was caused by moisture in a fire warning cannon plug. The investigation also revealed that the aircraft had been in a heavy rain storm with the canopy open not too long before its scheduled flight.

Heavy rains were listed as the cause for the malfunction. However, if Maintenance had not allowed the cockpit to be exposed to the elements the incident would not have occurred.

HYDRAULIC LEAK

THE SIGHT GAGE indicated the Nr 2 hydraulic system reservoir of the C-141 was empty, but neither the pilot's overhead panel or the engineer's panel indicated a loss of pressure. The Nr 2 hydraulic system was reserviced with 15 quarts of hydraulic fluid, and a normal check of the system was made to determine source of the leak, with negative results. The gear was extended normally and gear pins installed, emergency brakes were selected and a normal landing made. After landing, the scanner noted hydraulic fluid running down the Nr 2 engine pylon. The engine was immediately shut down and Nr 2 hydraulic system shut off. Investigation revealed the Nr 2 engine throttle cable had chafed a hole through the hydraulic pump suction tubing. The tubing had been improperly installed. Murphy again!

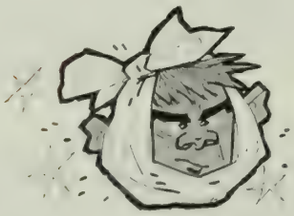
MAINTENANCE briefs



CASEY CHOCKJUMPER

A CHECKLIST does no good if the items thereon are simply given lip service. Ya gotta really check each item. Here's what can happen when you don't.

The ground crew, assisted by a jet engine mechanic, was running the engines on a KC-135 to ops check the oil pressure and EPR systems. The checklist was followed all the way. However, when Nr 1 engine was advanced to full dry power, the aircraft jumped the chocks and started a right turn. Throttles were retarded and full brakes applied. The aircraft stopped after traveling about 12 feet. No one was injured, and only minor damage was inflicted on the Nr 1 engine cowling, left nose wheel door and MD-3 power unit. No defects could be found in the brake system. They were just improperly set. The right brake was on but the left one was not. Now, back to checklists . . .



JAWBREAKER

THE SERGEANT, an experienced maintenance man, was about to be transferred. In fact, this was his last day on his present job before leaving for another base, so his mind wasn't really on his work. This cost him a broken jaw.

An F-4 was on the trim pad for a leak check and Nr 1 engine trim. The TSgt running the job was in the cockpit to operate the engines. During the leak check of the left engine, one of the crew found a small leak around the cap of the boundary layer control (BLC) collector bowl. After the engine was shut down he tried to remove the cap with pressure still on the system. The cap blew off and struck him in the face.

While this man was the primary contributor to his own injury, he had some help in that the TSgt supervisor did not understand exactly what the problem was – he thought it was merely a loose clamp – and he *assumed* that the other man knew exactly what he was doing. A good rule of thumb when working on airplanes is *don't assume anything.*

AS SPECIFIED IN T. O.

Lt Col Scotty O. Ferguson
Directorate of Aerospace Safety



ANOTHER DECADE has come to a close with some of you still involved with maintaining aircraft systems that you were sweating over when it started. After ten years of patching and repatching the same familiar machine, you have probably come to the conclusion that you pretty well have it hacked — you know your airplane like the back of your well-scarred hand. This is probably true. But even the old heads are subject to error. Many incident reports and occasional accident reports come through this directorate which prove this point time and time again. I'll give you a for-instance and it's close to home because it happened on a machine that was strapped to me.

I was flying an F-106 out of one of our ADC units when the secondary hydraulic system failed just after landing which, if you've got to have a failure, is a pretty good time. The cause was immediately apparent. The shuttle valve attaching bolt had been blown out of the right main gear actuator cylinder and was lodged in the wheel well. The investigators found that the threads within the actuator cylinder had been stripped. When full pressure was applied on the down side during gear extension, the shuttle valve attaching bolt was forced out, followed by great gobs of red fluid.

BACKWARDS NO BOOST



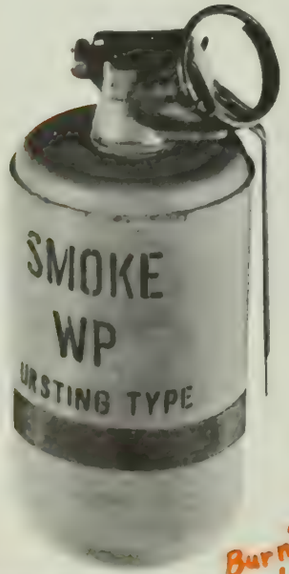


DURING PREPARATION for landing a C-130, the crew discovered that, with the autopilot disengaged, aileron control was normal to the left but restricted to approximately five degrees to the right. Various inflight procedures were attempted to no avail. Investigators found that during the last phase inspection the aileron boost package had been leaking. Corrective action was to reseal the actuator system and actuate it numerous times to purge air from the system. They also found that the cylinder sleeve, part number 110014, had been installed backwards. A test was run with a new aileron boost package, with the sleeve intentionally installed backwards. After 23 activations the movement became stiff, and on the 27th, the actuator froze. ★

EXPLOSIVES SAFETY

CORRECTION

Experienced munitions types will recognize the typing error in the caption beneath the WP smoke grenade picture on page 20, Jan 70 issue, *Aerospace Maintenance Safety*. "*Bursting*," in "Bursting type smokes look like beer (or soda) cans with vent holes in top," should have been "*Burning*." But, for those who didn't recognize the error, please be advised that burning type smokes are the ones that look like beer or soda cans.



BURSTING TYPE WHITE PHOSPHORUS SMOKE HAND GRENADE (M15). ~~BURSTING~~ Burning TYPE SMOKES LOOK LIKE BEER (OR SODA) CANS WITH VENT HOLES IN TOP.



FILMS RECOMMENDED

Film Report FR 920, SECRET, "Parking Explosives Loaded Aircraft (U)."

This 28 minute film is based on realistic full scale tests, basically designed by the Directorate of Aerospace Safety, and provides authoritative information to commanders and their staffs concerning results to be expected and risks involved in explosions on the flight line. Data given will assist commanders in reaching decisions related to operational effectiveness through preservation of their force.

Recommend maximum use be made of this film throughout all echelons. It was designed for viewing by major commanders, field commanders, and appropriate technical personnel having a need to know in pertinent assignments

(such as Safety, Munitions, Maintenance, Operations, Firefighting, Disaster Control, Civil Engineering, etc.) Copies have now been released to fill requests received through normal Air Force film channels.

Film Report FR 1207; "BIG PAPA — Explosives Storage Test Program."

This 18 minute unclassified film covers all four full scale test phases conducted under the direction of the Directorate of Aerospace Safety to test our modular concept of field storage. This storage concept was developed to permit storage of large quantities of munitions in limited land areas while providing reasonable protection of stocks from propagating explosions. Loaded storage sites containing 250,000 net pounds of explosives in bombs were detonated and results analyzed. The film was designed as a report to commanders and for the information of technical personnel (Safety, Munitions, Firefighting, Disaster Control, Civil Engineering, etc.)

DAMP RAMP

A couple of mishaps at the same base show how an overdose of rain can foul up the operation.

In the first instance a load team was dispatched to a B-52. While loading 750 lb bombs on a MER, the MJ-1 driver's foot slipped off the clutch pedal and the vehicle jerked forward. The bomb on the MJ-1 struck a bomb on the MER. The binder strap uncoupled and the bomb fell, striking the team chief on the leg and causing injury. The bomb rolled down the MJ-1 lift arm and stopped on the forward cowling with a damaged nose fuze.

Cause: Driver's foot slipped; steady rain which made everything wet and slippery.

About six weeks later at this base, a loading team was performing the same task—*in the rain.* The MJ-1 operator misaligned the bomb with the rack, lowered it and tried again. Apparently the bomb hit the rack, which caused the safety strap to pop loose. The operator saw the bomb coming and abandoned the MJ-1. The bomb fell nose down on the ramp and the MJ-1 struck the aircraft in several places as it moved along the fuselage. Another member of the team got it under control. The area was cleared and EOD personnel summoned to render the bomb safe.

Again—rain. The loading equipment was drenched and the team had worked for eight hours in the rain.

This isn't the first time something like this has happened and certainly won't be the last. We have to live with the elements, whether rain, snow, sleet, hail or hot sunshine, so remember the old standbys: Good supervision, good tech data, along with proper application of both, will help brighten a rainy day.

CHAOS IN THE CLASSROOM

"Hey, Sarge, how does this M131 flare work?" asked the airman who was helping the sergeant rearrange the Life Support Training classroom.

"I'll show you," said the sergeant, "there's really not much to it. Watch. First, get a launcher tube, then insert the parachute and signal assembly and pull the ring. That's . . . " Blam! The flare took off like a good flare is supposed to take off. This one ricocheted off the wall just four feet from the airman's head. Particles from the burning signal caused minor burns to his neck and one eye. The sergeant got a bruised arm from the recoil.

The signal finally stopped and the sergeant scooped it up with a parachute back pad cushion and threw it outside onto a concrete walk.

How did a live flare get into a training classroom? Nobody seemed to know. Furthermore, the item was not marked inert, so it should have been properly checked. Being realistic, would you have checked this item under the circumstances that prevailed?

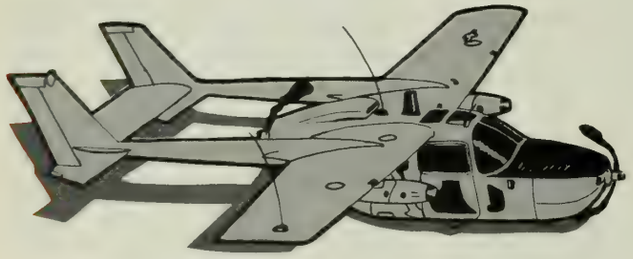
Now would be as good a time as any for all of you life support and teacher types to check the explosive items in your training equipment inventory to make sure you don't have any hot items. ★



AERO BITS

ICE. At Flight Level 420, the B-52 suddenly entered thick cirrus clouds and the crew felt light continuous turbulence. Visibility reduced to the point where they could just make out the outboard engine pods. Very shortly thereafter, the engines started compressor stalling and Nr 2, 3 and 8 flamed out.

Only number three would restart, even though the airplane descended to FL 350, within the airstart envelope. The crew had turned on engine anti-ice after they entered the weather. Apparently that was too late.



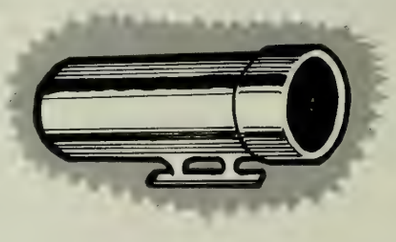
HERE WE GO AGAIN; It's an old story, and this one reads just about like all the other gear-up incidents you've seen in the past. But there's an unusual twist to this one that's worth keeping in the back of your mind.

An O-2 pilot, with enough time in the bird to be getting over-familiar with it, was returning to one of the busier SEA bases from a forward location. Number three for landing behind a C-130 and a C-46, he decided to make a 360 on downwind for spacing. He was reestablished on downwind as the C-46 approached touchdown. Calling in the base turn with gear, he pulled power back to about 12 inches, pushed the props forward and placed flaps full down. Halfway through the turn to final, he noticed that the C-46 had practically stopped 3000 feet down the runway. Because of the C-46, he set up a short field approach with about 14 inches of manifold pressure. The C-46 cleared the runway and the O-2 pilot, over touchdown, pulled off all power.

That's when he first heard the gear warning horn. It was too late to take the bird around. The gear-up O-2 slid to a stop, bending both props and doing minor damage to cowl flaps, antennas and fuselage.

Of course, the classic distraction and 360 on downwind, where this pilot usually lowers his rollers, set up this one. But investigators found the gear warning horn micro switches had vibrated loose. The horn would not sound until throttles were retarded to the full closed position.

Be a good idea to check the power setting where the horn starts to blow during flight, wouldn't it? And write it up when it's too low. Most gear warning horn complaints state that it blows at too high a throttle setting.



THERMOS BOTTLES. Something we didn't know, that was brought to our attention by the National Safety Council, is that those wide-mouth thermos bottles can be hazardous under certain conditions. Seems a metal spoon, or other object, could cause the glass liner to implode then explode. The result could be a face full of glass.

The NSC recommends:

- Never insert a metal object into thermos bottles. Pour the contents to get at them.
- Avoid temperature contrasts such as ice cubes in hot coffee, or a hot substance into something very cold.

Some of our aircraft have these containers aboard, but they are more likely to be found in your own home. So pass this message along to the wife and kiddies.

U. S. GOVERNMENT PRINTING OFFICE: 1970 39K-396/7

WRONG HAND-LE. In the F-100 we've seen pilots punch off stores when they want to drop the tailhook, sometimes they drop the hook when they wanted to punch stores. In the F-101B there have been cases of pilots grabbing the gear handle when they wanted the drag chute handle after landing. Now the '106 is getting in the act.

An F-106 pilot with over 400 hours in the airplane was practicing an SFO. Due to the strong crosswind, and to save altitude because his pattern looked kinda wide, he held his gear until low key. When he decided it was time for the gear, he was busy looking out the right side of the canopy, judging his distance from the runway. As soon as he did it, he realized his error and immediately jettisoned the drag chute, lowered his gear using the correct handle, and proceded to land the airplane.

We could say, "That's what a fighter pilot gets for flying a right hand pattern." But the problem really goes deeper than that.



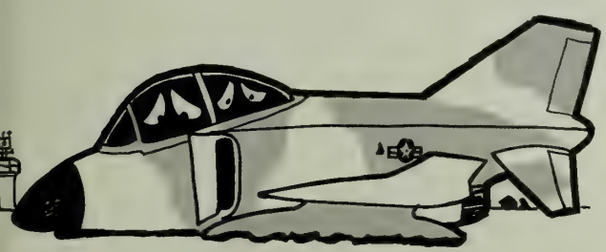
PEOPLE PROBLEM. Recently an HH-53 was climbing out after takeoff, enroute to rendezvous for refueling. While the pilots were busy maneuvering into position on their tanker, two crewmembers back aft decided to install the emergency escape hatch. They did not obtain clearance to do this from the aircraft commander and didn't know that the helicopter was operating above the airspeed recommended for hatch installation. The hatch caught in the rotor wash, tore from their hands, snapped the nylon retaining strap and fell away.

The crewmembers involved had been briefed on the proper procedures and had read an item in the FCIF on the subject.

WHAT'S FOR LUNCH. "The F-4 was cleared for a TACAN penetration and approach and turned over to Tower at approximately 17 miles. Radio contact with Tower was established at about eight miles on final. The crew was told to report five-mile final and did so, at which time Tower issued landing clearance. The aircraft touched down smoothly in the center of the runway, the drag chute was deployed and the bird continued straight ahead coming to a stop after approximately 5000 feet of slide. Parts of the centerline tank departed the aircraft after 1000 feet, but the external wing tanks, though ruptured, remained with the aircraft. Damage assessment is delayed because the aircraft is resting on the flatttened tanks.

"The crew states that although they completed a descent checklist and the initial landing check at 20 miles, no further checklist items were accomplished and they did not lower gear or flaps."

Ho-hum . . .





GERONimo-o-o. Another case of an object falling from an aircraft in flight turned out to be a lot more serious than the helicopter hatch incident above. This time it was a navigator!

Returning to base after a combat mission, the navigator of a C-130 began storing equipment by an open door in the rear of the aircraft. Handling and moving equipment directly in front of him, the navigator frequently bumped the front of his chest pack parachute. Eventually the parachute pins worked loose. When the pilot chute popped out, it went right out the door, followed by the main chute—and then the navigator. He was rescued at first light the next morning with only minor injuries.

The unit has discontinued use of chest-type parachutes for people working around open hatches and doors. They're using either back packs or harnesses minus parachutes, plus restraining lines. ★

UNITED STATES AIR FORCE

WELL DONE AWARD

Presented for outstanding airmanship and professional performance during a hazardous situation and for a significant contribution to the United States Air Force Accident Prevention Program.



CAPTAIN
Richard B. Bugeda



CAPTAIN
Garlin D. Pill

355th Tactical Fighter Wing, APO San Francisco 96273

On 19 March 1969, Captain Bugeda and Captain Pill were flying an F-105 on a local training mission from Kwang-Ju ROKAFB, Korea. Departure weather was 1000 foot ceiling with four miles visibility in ground fog. The top of the clouds was at 19,000 feet. Upon arrival back at the TACAN holding fix for Kwang-Ju, the crew heard a loud explosion followed by severe engine vibration that made the instruments almost impossible to read. The crew immediately elected to attempt a safe recovery in spite of several limiting factors: The fuel remaining would necessitate a heavyweight landing. The instrument penetration through 18,000 feet of weather would be without the aid of ground radar control. Cockpit instrumentation interpretation would be very difficult due to the vibration. The terrain was mountainous with peaks up to 4800 feet. The crew would have to deviate from the long published penetration and approach due to the unknown engine condition.

With Captain Pill operating the aircraft radar to provide terrain avoidance and navigation assistance while continually aiding Captain Bugeda in reading the vital instruments, they managed to maneuver safely to a point seven miles from the runway at idle power setting. Then Captain Bugeda established landing configuration and started a glide 50 knots faster than normal instrument approach speed while Captain Pill provided azimuth and range information from the aircraft's radar. The aircraft broke out of the weather at 400 feet, one and one-half miles from the runway. Although the throttle was in the full military position the airspeed continued to decrease. Captain Bugeda continued the approach and successfully landed within the first 500 feet of the runway. The outstanding teamwork, calm and professional actions of this crew under extreme stress saved a valuable combat aircraft. WELL DONE! ★

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FLYS

UNITED STATES AIR FORCE • APRIL 1970

Aerospace SAFETY

FOR AIRCREWS, MAINTENANCE & SUPPORT TECHNICIANS

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FROM INSTRUMENT TO CONTACT PAGE 10

Aerospace SAFETY

FOR AIRCREWS, MAINTENANCE & SUPPORT TECHNICIANS

April 1970 AFRP 62-1 Volume 26 Number 4

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Perhaps it's a bit early, but a
we finish production of this secon
issue of the combined *Aerospac*
Safety and *Maintenance Safety* mag
azine, we wonder if we're on th
right track. You are the custome
and we would like for you to te
us whether you are a maintaine
aircrew member or in any suppo
function. Let us hear from you b
card or letter. Your comments an
suggestions will help us help you

This month there's a prett
good mix of maintenance an
operations material ranging fro
an article on the problems an
successes of instructor pilots t
one on reciprocating engines.

"A Big Man In Your Life," pag
1, is about IPs. Every Air Forc
pilot has flown under the survei
lance of many IPs and many pilot
are, have been or will be, IPs
In this article IPs will recogniz
some of the facets of their jo
For you someday-to-be instructo
pilots the article may provide som
insights into what to expect.

Both maintenance and the ai
crew figure in "Analysis of a
Accident," page 6, and "T-39 E
gines," page 14.

Strictly for aircrews is "Fro
Instrument to Contact," page 1
while "Welding Safety," is a
dressed primarily to you maint
nance types. ★



A BIG MAN IN YOUR LIFE

From 1967 through 1969 instructor pilots saved aircraft. If anyone can furnish a number to fill the above blank we would appreciate a call from him. So far the phone hasn't rung.

By changing the wording in the first paragraph, we can provide a number: From 1967 through 1969 there were 69 accidents in which IPs were involved. Thus, we can record an IP's failures but not his successes.

This is one of the frustrations of the IP's job. Seldom does any one, perhaps not even he himself, know exactly how much he contributed to the successful training of a student. The student may satisfactorily complete the course, but he may have been able to do it on his own. This is not strictly true of pilot students simply because of the physics of flight. But once the student has got the feel of the airplane, does he really need an instructor? Could he, through practice and study, make it on his own?

You may have heard it said that teachers teach because they can't do. This is probably seldom true in any discipline and is totally unrealistic when applied to instructor pilots. In order to succeed, the IP must combine a thorough knowledge of the aircraft he is instructing in, the general store of knowledge and technical compe-

tence that all pilots must possess, plus that rare ability to relate to others and motivate them toward a learning goal.

Placing a pilot on orders as an instructor does not make him one. About all this really *guarantees* is that there will be two pilots in the aircraft, one of whom is qualified to fly it.

Most of us could write a book on "IPs I Have Known." Some of these would surely make interesting reading. Equally interesting would be one about a student pilot with chapters by his various instructors.

In the flying business one is eternally a student. First, you learned from a series of instructors in undergraduate pilot training. Once you got your wings you immediately went back into student status while you checked out in an operational aircraft. From then on throughout your career, every time you switched to a new airplane, it was an instructor pilot who helped you through the transition.

IPs occasionally fail. Some of these failures go undetected—a student (perhaps an experienced pilot in other type aircraft) certified as qualified when, in reality, he isn't, or is only marginally so. This may not show up until years later when his ineptness finally catches up with him and he makes the accident files. Other IP failures appear as accidents in which the IP was either the primary or a contributing factor. Most of the reports on IP-involved accidents contain words to the effect that "the IP allowed the student to place the aircraft into a position from which recovery was impossible!"

This was the board finding following an accident that occurred a couple of years ago. During a transition training flight in an F-4D, the aircraft broke left from initial and was then observed on downwind in a rolling descent until it struck the ground. The crew went in with the aircraft.

The approach and landing phase of flight is the most demanding and the least forgiving, because of the proximity to the ground, maneuvering that must be done and low airspeed. This is the regime of the classic instructor-involved accident. The IP is in a precarious position. He must bring to bear all his experience, a shrewd judgment of the student's ability and predictability, along with a sort of sixth sense that helps him determine how far to let the student go and at what point he should take control.

This is the moment of truth for the instructor, the point at which the real instructor emerges, or just a pilot on orders as an IP.

Occasionally — and fortunately these occurrences are fairly rare— an instructor creates his own mishap. Such as when, at a critical point on final approach, an IP shut down two engines on a four-engine transport. The pilot lost control and the aircraft stalled off the end of the runway.

In a somewhat similar accident involving a C-123K, a simulated engine-out landing was being performed with the jets at idle, one recip at 1700 rpm and the other at 2600 rpm. Despite a Dash One warning against single-engine go-arounds, when it became obvious that the pilot could not make a landing the IP called for a go-around. In the ensuing crash, the aircraft was destroyed and one crewmember seriously injured.

The factors leading to these accidents can be called errors of commission. There are also errors of omission. Among the IP's responsibilities is that of safety pilot. He is the pro who, for example, doesn't permit a landing without the gear down. Yet in 82 reported gear-up landings from 1964-1969, the IP did just that 18 times. While this may indicate that IPs are just human, it also leads to the suspicion that at least some of these were IPs simply because they were on orders as such.

Before we condemn the IP for his mistakes, let's look at some of the facets of his job. Since he flies a great deal he is expected to be highly proficient. But, depending somewhat on the type of aircraft and curriculum, he may not perform some maneuvers very often. For example, he may defer to his students and not make very many landings himself. This is something he has to guard against.

Major William P. Hurn addressed this problem in his article, "The SAC IP," in the January 1970 issue of *Combat Crew*. ". . . The best flying approach I have heard of to date came from a 15th Air Force Accident Cause Elimination program brochure: 'First You Fly the Airplane.' This approach applies to student flying as well as when the IP is at the controls. Few inflight emergencies are worse than losing control of the airplane, or letting someone lose it for you. I believe that stick and rudder skill is the single most important factor in the recovery of many serious aircraft emergencies. Sure, any pilot can make a landing but suppose you have to put it on a narrow strip of foam—or . . . on the end of the runway with no flaps—or your controls don't work just right—or the weather is in the woods. The IP cheats his students as well as himself if he lets his own proficiency deteriorate to an unsafe level."

There is also the fact of high exposure. Most IPs fly a great deal; therefore, they are more exposed than the average pilot to problems resulting from maintenance errors and materiel malfunctions and failures.

The IP is placed in a particularly vulnerable position because he does not fly as part of a thoroughly trained team. In the case of the multi-engine bomber, the IP is not part of a regular crew that works day after day together. Except for the fact that several aircraft may be involved, the fighter IP has the same problem—shortly after his students get proficient they are gone and he starts over with new students. Consequently, in an emergency the IP does not have an experienced, well coordinated crew to work with and may even be hampered in handling the emergency by the action of the student. Imagine the IP's emotions after the following incident:

On final approach the student pilot inadvertently feathered one of the two engines. In the instant it took to analyze what had happened, the IP increased power on the good engine. Thinking they were going around, the student retracted the gear. The IP immediately ordered the gear lowered and the student got the flap handle instead. Meanwhile, the IP told the engineer to bring the engine back in. Unfortunately, the engineer hit the wrong button and feathered the remaining engine. The IP put the gear down himself and made a successful landing, despite the confusion. Then to cap this incident, the engineer moved the gear lever to "Positive Lock" and the gear collapsed on the runway.

His exposure to many different students with their different abilities and personalities requires the IP to be constantly alert. He simply can't afford to relax as much as he could if he were flying as a regular crewmember. When a crew works together for some time they become a team and each member gains a pretty good idea of what to expect from the other members.

Working with students, the IP must be much more thorough in his preflight briefings. He can't afford to leave anything to chance, and he must do everything possible to make sure that the student knows what will be expected of him especially in an emergency. The accident files contain examples of situations in which apparently no one was flying the aircraft, and, conversely, some in which both the student and IP were trying to control the bird and working at cross purposes. Flying down final approach is a poor time to accomplish the briefing that should have been made prior to the mission.

Just last year an IP was discussing a procedure with a student as they were on the approach for a touch and go. Concentrating on the item under discussion, they lost their continuity on the checklist and made a gear-up landing. This despite the warning horn which operated, and a flight engineer who didn't.

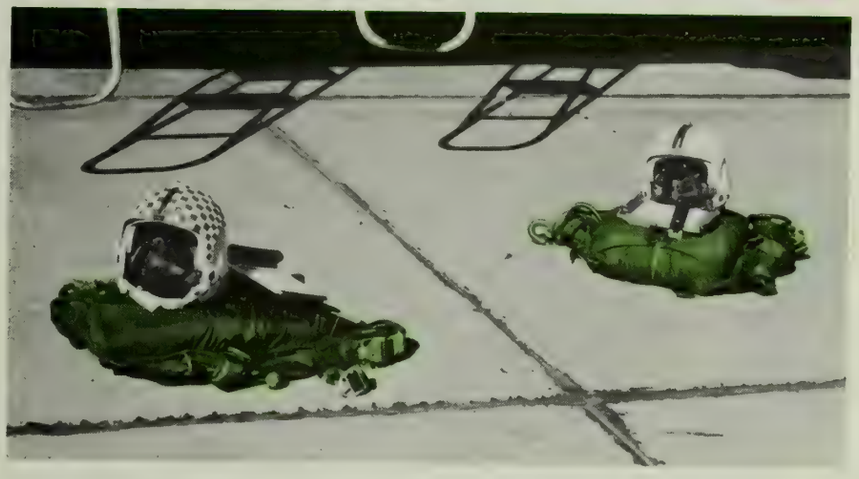
The problems of an IP are many and he has a job that is both mentally and physically fatiguing. He is responsible to the Air Force, the student and himself. He deals with many different personalities, including officers who outrank him. He is expected to be both an excellent technician and an effective instructor.

The rewards cannot be measured in any finite way. He doesn't receive any extra pay. He frequently works long hours. The element of risk is high. He often prevents accidents that would have occurred except for his actions. Only he and the student—and sometimes not even the student—know of these saves. It is just part of the day's work.

Every pilot owes something to some IP back along the line, although he may even have forgotten his name. But you remember him, perhaps because he saved your life, or he was patient and understanding when that was called for, and always demanding that you produce the best in you.

Your success as a pilot is a measure of his success as an IP. How good was he?

ED. NOTE. Since practices vary among commands with different missions, each statement referring to IP problems and practices does not apply to every command. To be specific would result in excess verbiage and, in the author's judgment, would unnecessarily complicate the intended message. ★



MAULING MORIBUND MUSTANGS



Maj W. M. Thompson, Hq ATC

While safety types are sometimes accused of beating dead horses, we occasionally find ourselves whupping one that ain't dead yet. One mustang that keeps getting up off the mat is the Intrepid Aviator Syndrome. Whether we like to admit it or not, most of us airplane drivers suffer from this affliction to some degree. If we didn't we'd probably be raising cattle or selling insurance, or broking stocks, instead of muscling aluminum around the airpatch every day. The problem isn't so much that we're motivated. That's good! Rather, the problem is controlling that motivation, so we can operate rationally in a profession which is literally a running series of life and death situations.

So what is the Intrepid Aviator Syndrome? It's hard to define exactly, but the symptoms run the spectrum from sheer irresponsibility, through false pride, and all the way to the kind of mission dedication that causes people to give up their lives to accomplish a maneuver. Here are some actual examples of the Syndrome at work:

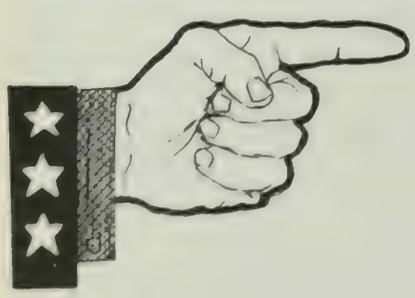
• An instructor and his student were motoring joyously up a canyon one day. All went well until they struck a cable, abruptly terminating the mission (and, incidentally, their lives.)

• An adverse crosswind and a tight pitchout caused a solo student to overshoot the final turn. His pride evidently outweighed the good advice he was getting from the RSU, because he kept trying to bring it around until he spun it in.

• A student botched up a maneuver so badly that the aircraft entered a high speed dive. Hoping to make the best of a bad situation and get the mission done, the instructor decided to grade the student's recovery, rather than assuming control and recovering himself. You guessed it. The student botched that up, too.

So grows our accident file. You have 'em, we record 'em, hopefully with a lesson learned and another dead horse we can stop beating. Sadly, in the case of the Intrepid Aviator Syndrome, the odds are roughly six to four that the next accident will make us wish we'd said all this better.

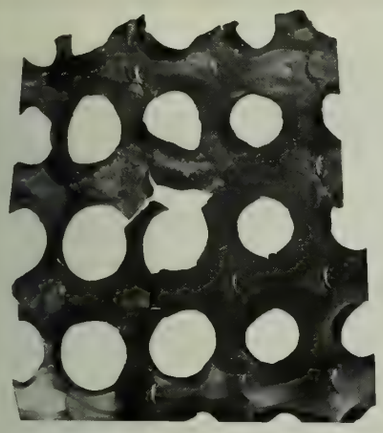
(Reprinted from ATC Safety Kit) ★



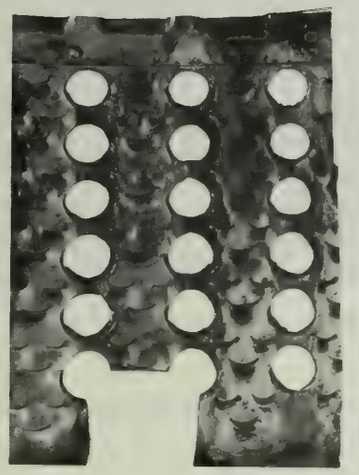
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384th BOMB GROUP REUNION

The 384th Bomb Group plans to have its second reunion at the Palmer House in Chicago, July 10 through 12. For more information write to the 384th Bomb Group, Inc., P. O. Box 766, Wall Street Station, New York 10005.



INNER COMBUSTION LINER



OUTER COMBUSTION LINER



1ST STAGE TURBINE NOZZLE

DAMAGE DUE TO AVGAS

which fuel?

A serious fuel-engine mismatch occurs when a reciprocating engine is serviced with JP-4. The jet engine, however, will digest a relatively wide band of fuels, from JP-5 to gasoline within certain limitations.

Normally, the limitations involve reduced performances because of volatility differences between alternate fuels and JP-4. For example, difficulties in starting (especially air starting) have been experienced when using JP-5 in standard Air Force engines. The engines can be modified to operate efficiently on JP-5, but at a prohibitive cost.

For two very good reasons, use of gasoline as an emergency fuel in jet engines should be carefully controlled. The least critical is the lack of lubricating properties in gasoline which can affect P and D valves, governors, pumps, and fuel control operation. The more serious effect of prolonged use of AVGAS in a jet engine is extensive hot section deterioration.

There are a few recip aircraft equipped with auxiliary jet engines that burn AVGAS. They are the C-119Ks and the C-123Ks used in SEA, where a little extra thrust is always welcome. These J85-17 engines have been operated for enough hours to provide sufficient knowledge of the effects of continuous use of gasoline as fuel. The results graphically emphasize the necessity of limiting the use of gasoline to emergency operations. The difficulties include slow acceleration, hung starts, and an average of approximately 250 hours between hot section maintenance in a 400-hour periodic inspection cycle.

The accompanying pictures show deteriorated parts removed from a new J85-17 engine after only 193 operating hours. Most of the damage was caused by lead compounds in the gasoline combining with the engine base metal. This creates an alloy with a low melting point, resulting in accelerated erosion of hot section parts. Increased corrosion, including the intergranular type, is also experienced.

One or two tanks of AVGAS won't cause the damage illustrated in the pictures, but there will be some deterioration—which is the reason for gasoline being declared an *emergency* jet fuel. To prolong the life of the engine and lengthen the span of time between hot section maintenance actions, just fill the tanks with good ol' lubricating JP-4. ★

ANALYSIS OF AN INCIDENT



people problems defeated four safety checks in the system

BLC boundary layer control, on the F-4 increases lift and allows lower takeoff and landing speeds. It does this by blowing hot air from the engine over the wing and the trailing-edge flaps while flaps are extended. With flaps up, the air is shut off. But when something goes wrong, and the hot air does not shut off and is trapped in the wing by flaps in the raised position, you've got trouble.

That's how it was for an overseas F-4 crew early this year. They found a BLC warning light staring them in the face when they retracted flaps after takeoff. While they were decelerating to flap lowering speed, the warning light went out. And the "wheels" light did not flash. Normally it will flash when hot air burns through the wiring for the BLC light.

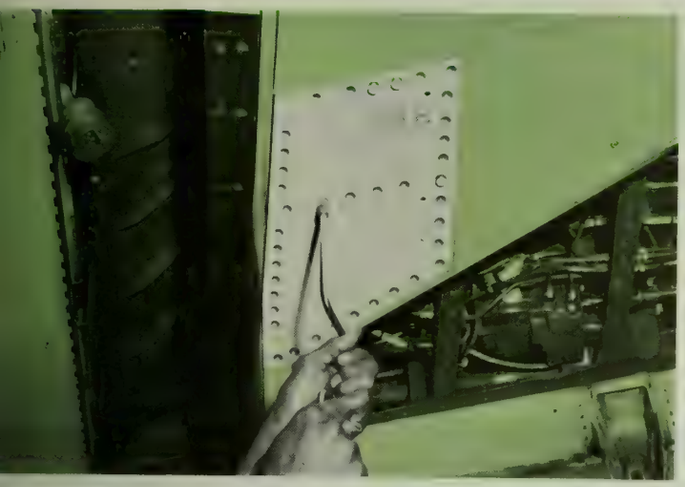
The crew, thinking the BLC valve had closed and shut off the hot air, decided to press on with their gunnery training mission.

About 20 minutes later, when the external fuel tank lights should have illuminated, the aircraft commander found the entire telelight panel was inoperative. More checking revealed that the warning light circuit breaker had popped. And it would not reset.

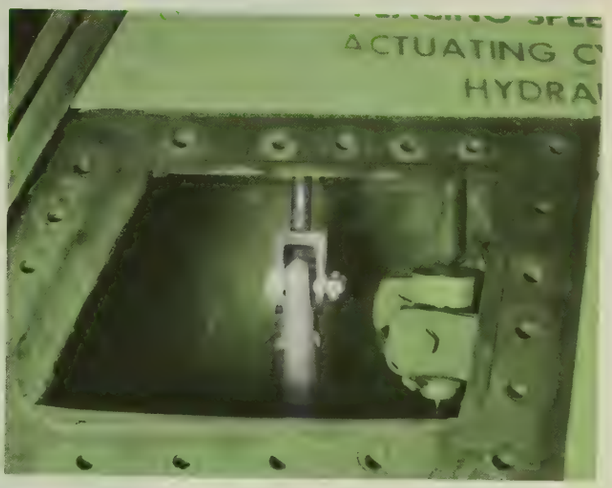
But while he held the circuit breaker in momentarily, the aircraft commander saw the "wheels" light flashing. Realizing that the components within the wing had been exposed to extremely hot 17th stage air since flap retraction, the crew immediately (and belatedly) turned for home base and tried to lower the flaps. But by now the flap circuit breaker had popped. They had to use the emergency system. Making a reduced power descent, they returned to the field and landed without further incident. Damage from the hot air required replacement of the right trailing edge flap, its actuator and BLC duct, the right BLC valve and three limit switches.

The present F-4 Dash One doesn't say anything about a BLC light that comes on when flaps are raised and then goes out in a few seconds (this one lasted about seven seconds). Previous publications have contained cautions about this type of situation, warning of just what happened to this crew. The absence of a flashing "wheels" light after the BLC light goes out does not necessarily mean that all is now okay. As in this incident, it may mean that more than just the BLC valve is damaged. And more damage will follow if you don't do something about it pronto!

Or look at it this way, when the



Door 89R was secured. Flight Line didn't inspect under it.



BLC rods on the left had been connected, but not on the right.

BLC light goes out treat it as you would a fire warning light—check the circuit.

Maintenance caused this one. The aircrew was set up for their procedural error by lack of communication between maintenance work centers and a brief, inadequate 781 write-up. Here's how it happened:

Nine days before this flight, the airplane went into maintenance for an aircrew BLC write-up. In the course of troubleshooting, all BLC rods were disconnected. A Form 781 entry was made stating, "Trailing edge and leading edge BLC rods disconnected FOM" (to facilitate other maintenance). The rods were all removed and replaced, but before the job was completed, the aircraft was moved to another work center for other maintenance.

During the transfer someone secured door 89R without making an entry in the form. When flight line personnel completed their checks they signed off the forms with the entry, "TE & LE BLC rods connected." Since door 89R was secure when his troops got the airplane the supervisor assumed that maintenance had not been performed in that area and signed off the inspection without checking.

In fact, the right trailing edge valve-to-bellcrank link rod was not connected. That was why the right trailing edge BLC air did not shut off after takeoff when the flaps were raised. Normally this situation would be identified by the crew chief during the before-taxi BLC check. However, investigators found it is possible to position the trailing edge valve actuator rod in such a manner that the butterfly valve will be closed, but when BLC air pressure increases the valve is forced open. In this case the valve probably remained closed until power was applied for takeoff.

This incident occurred, or more specifically the airplane was damaged, despite four checks built into the system to prevent it. First, the requirement to record the start of the work on the BLC system as a Form 781 entry which must be cleared before flight. Second, the requirement that this work will be inspected and signed off by a maintenance supervisor to insure it is completed correctly. Third, the BLC check performed by the crew chief after the aircrew has engines running, before takeoff. And fourth, the aircrew's emergency procedure when a BLC warning light illuminates.

Each one of these checks was circumvented, the damage

ANALYSIS OF AN INCIDENT

occurred. The Form 781 entry, "TE & LE BLC rods disconnected," was not specific, accurate nor detailed enough. An entry that read "RH & LH TE & LE BLC rods disconnected," would have prompted the inspecting supervisor to look inside door 89R.

Flight line personnel, closing up the job, *assumed* that only one side had been worked on. And then the maintenance supervisor bought their assumption. To be thorough he should have checked both sides, since the original form entry did not specify one side or the other.

The crew chief's BLC check was performed the way it is supposed to be. It was circumvented by a chance positioning of the disconnected BLC rod. The oversights and omissions which preceded it invalidated the crew chief's check.

Finally, the aircrew made an assumption which permitted the damage to become as severe as it did. Perhaps, if the aircraft commander had checked the warning light circuit when he saw the BLC light go out, he would have been able to minimize the damage to the airplane by lowering flaps immediately and getting the airplane on the ground as soon as possible.

Assumptions, inaccuracies, oversights and omissions defeated the safeguards in the system which are supposed to prevent damage, accidents, injuries. Put another way, the system broke down because the people in it did less than their best.

Systems, procedures, and safety checks don't prevent accidental damage and injury.

People do. ★

The crew chief's BLC check was invalidated.





The GUNFIGHTERS of the 366th TFW are having their first practice reunion for all officer members in Tampa, Florida, 19-21 June. All members, past and present, are requested to write for details and submit their address to: "GUNFIGHTERS," Box 6586, MacDill AFB, FL 33608.



THE I.P.I.S. APPROACH

By the USAF Instrument Pilot Instructor School, (ATC) Randolph AFB, Texas

TRY THIS QUIZ ON FLIP TERMINAL CHARTS

1. On the profile view on an ILS approach, outer markers usually have numbers in light print. What are they used for?

a. Mandatory altitude for crossing outer marker while on ILS.

b. Altimeter check with glide slope centered.

c. Minimum altitude over outer marker for localizer only approach.

2. What is the obstruction clearance difference between Emergency Safe Altitude and Minimum Safe Altitude?

a. Emergency safe 1000′ and 2000′ in mountainous terrain.
Minimum safe 1000′

b. Emergency safe 1000′
Minimum safe 1000′

c. Emergency safe 2000′
Minimum safe 1000′ and 2000′ in mountainous terrain.

3. Some low altitude approach charts depict a minimum safe altitude while others depict minimum sector altitudes. What's the difference?

a. Minimum safe altitude is depicted when the obstruction height throughout the area is uniform.

b. Minimum sector altitude is used in mountainous terrain only.

c. Minimum safe altitude is used in mountainous terrain only.

ANSWERS: 1. b, 2. a, 3. a

AIM

Q Are we required to comply with the Airman's Information Manual (AIM)?

A No. AFM 60-16 states in paragraph 1-2 that Air Force pilots are operationally governed by 60-16 as supplemented by appropriate authority, FLIP, USAF Foreign Clearance Guide, NOTAMs, Aircraft Flight Manuals and instructions issued by air traffic control agencies. However this does not preclude Air Force pilots from becoming familiar with the AIM. There is considerable information of worth for all pilots.

WEATHER FORECAST

Q The weather forecaster put a forecast of intermittent 100 feet obscured and 1/4 mile visibility in the destination forecast block on the DD Form 175-1. In the Remarks block he forecasts a prevailing condition for the destination of 500 feet overcast and one mile visibility. With published minimums of 200 and 1/2 can I legally file to that destination?

A Yes. AFM 60-16, 17 July 1969, cleared up several "gray areas" about destination and alternate weather requirements for IFR flight. These requirements can be summarized as follows:

1. Use prevailing conditions to determine if your destination is above minimums for filing purposes. (AFM 60-16, par 8-4, NOTE)

2. Designate an alternate if the *worst* forecast condition (prevailing or intermittent) at your destination is less than 3000 feet ceiling and three miles visibility or two miles more than the lowest published landing minimum, whichever is greater. (AFM 60-16, par 8-5)

3. To determine if an airport will qualify as an alternate, use the worst (intermittent or prevailing) conditions forecast. (AFM 60-16, par 8-6)

In most situations, forecasts for intermittent conditions will be for lower weather than prevailing. Air Force pilots will use the worst (intermittent or prevailing) forecast as the determinant for filing requirements in all cases, except for determining if the proposed destination is above minimums.

The Air Force rationale is to provide the pilot with maximum latitude when selecting a destination while insuring that an alternate is available in the event conditions deteriorate while enroute. The IPIS would remind all pilots that there is no better way of updating weather forecasts than PFSV and Flight Service. ★

The critical time in an instrument approach with restricted visibility is when the pilot transitions



from instrument to contact



Maj Donald L. Carmack, Test and Evaluation Branch, IPIS Randolph AFB, Texas

Transition from instrument to visual conditions during an approach in obscured weather is seldom distinct. This type of weather presents pilots with a number of problems not encountered during an approach that is either hooded or has a cloud base ceiling. At the point where the hood is pulled or the aircraft breaks out below the ceiling, the visual cues used to control the aircraft are usually clear and distinct, and there is instantaneous recognition of the position of the aircraft in relation to the runway.

With obscured ceilings or partially obscured conditions the reverse is usually true; visual cues are indistinct and easily lost. Discerning aircraft position laterally and vertically in relation to the runway is difficult. It is essential to consider every factor that might have a bearing on the final stages of an approach and landing, e.g., the visibility, type of weather, expected visual cues and even crew procedures and coordination. Preparation and understanding are keys that will make the transition smooth and precise; to accomplish the transition safely and routinely, the pilot must have a thorough understanding of the weather environment and how it affects the availability and use of visual cues.

RESTRICTIONS TO VISIBILITY

Rain, smoke, snow, haze restrict visibility but the most common restrictive element is fog, which may be encountered in a number of different forms, each with its own particular hazards. When visibility restrictions exist and the sky is totally hidden from the observer, the sky is reported as obscured and the reported ceiling is the vertical visibility from the ground. A pilot executing an approach in an obscured condition will not normally see the approach lights or runway environment as he passes the level of the obscured ceiling. He should be able to see the ground directly below him; however, the transition from instrument to visual flight

will occur at an altitude considerably lower than that reported for the vertical visibility.

In partially obscured conditions, vertical visibility is not reported since the ground observer can see through the obscuration or a portion of the sky is not hidden by the obscuring phenomenon. But when clouds are visible with a partial obscuration their heights and amounts are reported. The amount (in tenths) of the sky or clouds obscured by a partial obscuration is included in the remarks section of weather reports. Although this may help clarify the reported conditions, it still does not provide an idea of the height at which visual cues will be sighted or give the slant range visibility. In some cases the partial obscuration can be associated with shallow patchy fogs, so the pilot can expect to lose visual references once the fog is entered.

Also of concern to the pilot is the visual range at which he will be able to discern visual cues for runway alignment and flare. He must be aware that the reported runway visibility or runway visual range (RVR) may not be representative of the range at which he will sight the runway. In fact, the pilot's slant range visibility may be considerably less than the reported RVR. Another factor that he must consider is the decrease in the visual segment due to an aircraft's downward vision angle (angle from the pilot's eyes over the aircraft's nose measured from the horizontal). This also may be several hundred feet.

Once all of these factors and the destination weather are understood, the pilot will possess the knowledge to effect a safe, smooth transition from instrument to visual flight. Restrictions to visibility Air Force pilots may encounter include, but are not limited to, the following:

Shallow Fog: Seldom exists to a height of over 200 feet and is usually associated with partially obscured conditions. Since the fog may be patchy, it is possible that the visual segment may vary considerably during the approach and rollout. Also, the pilot may be misinformed if RVR is measured by a transmissometer located in an area of good visibility.

The most serious problem with this type of fog stems from the abundance of cues at the start of the approach. The pilot may see the approach lighting system and possibly even some of the runway environment during the early stages of an approach. However, as the fog layer is entered, most or all the cues may be lost. If the pilot is not flying instruments, he may become confused and disoriented. In the shallow fog condition, pilots should not rely entirely on visual cues for guidance. They can be brought into the cross-check to confirm position, but instrument flight must be maintained until visual cues are perceived and can be kept in view, and the runway environment provides sufficient references for flare and alignment.

Deep Fog: Exists to a height of several hundred feet and is usually associated with obscured conditions. The pilot will not normally see cues during the early portion of an approach. More likely, he will view cues from only the last one thousand feet of the approach lighting system. With a U.S. Standard A approach lighting system, in rapid succession he will probably see cues from the thousand foot bar, the last one thousand feet of the centerline approach lights, red terminating bar, red wing lights, green threshold lights and the high intensity runway edge lights.

At night if the strobe lights are on, they may produce a blinding effect. Landing lights may do the same. The transition from a deep fog approach involves the integration of visual cues within the cross-check during the latter portion of the approach. Again, it is essential to be thoroughly familiar with the approach lighting system in order to develop the proper perspective between these cues and the ensuing runway environment.

Cloud Base Fog: Usually forms above the surface of the runway and is associated with low ceilings. Since this type fog forms more of a definite ceiling, better visibilities can be expected once the ceiling is passed. Therefore, the transition from instrument to visual flight is sharper with more pronounced use of visual cues after passing the ceiling. Night approaches may produce the sensation the aircraft is high once the cloud base is passed. The pilot should continue on instruments, cross-checking visual cues to confirm runway alignment. During flare the pilot may experience a sensation of descending below the surface of the runway. This will be especially pronounced at facilities with 300 foot wide runways. In either case, the pilot must avoid large attitude changes which



from instrument to contact

CONTINUED

might produce a duck-under or over-rotation.

Sea Fog: In most fogs the pilot expects very little wind and is not too concerned with side slip or decrab procedures. Sea fogs, however, can present pilots with wind and turbulence problems not associated with other fogs. Because of the turbulence, it is more difficult to maintain precise instrument flight, and the pilot can encounter sea fogs with characteristics similar to shallow, deep or cloud base fogs. The characteristics of sea fog are related to the wind speed, for the fog deepens as the wind speed increases. Winds greater than 15 knots usually form a cloud base fog, due to the lifting action of the turbulence.

The pilot's best procedure is to be aware of the conditions which might be encountered and to integrate visual cues within the crosscheck during the latter portion of the approach. Since crosswinds do exist, the pilot must be prepared to decrab while avoiding large attitude changes which might produce an undesirable touchdown attitude. Also, airspeed must be more closely monitored because of the effects of turbulence and the decrab.

Ice Fog: Most common to the arctic region; however, can occur in other areas if the air temperature is below about —25° F. It consists of a suspension of ice crystals in the air and is mainly an artificial fog produced when hydrocarbon fuels are burned. When there is little or no wind, it is possible for an aircraft to generate enough fog during landing or takeoff to cover the runway and a portion of the field. When atmospheric conditions are such that ice fog may form, careful preflight planning is a must.

Rain: Approaches and transition to visual flight can be very hazardous since moderate to heavy rain conditions may seriously affect the use of visual cues. Night approaches in these conditions can be even more critical as the pilot may be blinded by flashing strobes or runway end identifier lights. Transition to visual flight can be severely hampered by the pilot's inability to adequately maintain aircraft control and interpret his instruments in gusty or turbulent conditions. Moderate or heavy rain can render the rain removal equipment ineffective and cause obscuration of visual cues at a critical time during the transition. In these conditions the pilot must have an alternate course of action and be prepared to act without hesitation.

Snow: Blowing snow is accompanied by many of the same hazards as rain, such as turbulence, difficulties in reading the flight instruments, obscured visual cues and aircraft control problems. Of special interest will be a lack of visual cues to effect runway identification for the visual portion of the approach. The approach and runway lights will provide some identification; however, runway markings and the contrast between the runway and its surroundings will be lost in the whiteness. Depth perception may be difficult; therefore, the pilot must place more emphasis on instrumentation for attitude control. It is extremely important to avoid large attitude changes during approaches in snow.

VISUAL CUES

Approach lights, runway markings, lights and contrast are the primary visual cues. At some facilities touchdown zone and centerline lights may also be available. To be effectively prepared for the transition to visual flight, the pilot must become familiar with the lighting and marking patterns provided at his destination and correlate them with the weather. In minimum visibility conditions, the visual cues and references for flare and runway alignment are extremely limited compared to the normal references the pilot uses during a visual approach. Therefore, projected touchdown point may not be within the pilot's visual segment until he is considerably below published minimums. Any abrupt attitude changes to attempt to bring the projected impact point into the pilot's visual segment may produce high sink rates and thrust/lift management problems at a critical time. These so-called duck-under maneuvers must be avoided during the low visibility approach.

Another type of duck-under is encountered when the pilot attempts to land within the first 500 to 1000 feet of the runway after breaking out of an overcast. In this case the pilot attempts to establish a visual profile similar to the one he uses most often. Establishing the visual profile usually involves power reduction and an attitude change to aim the aircraft at some spot short of the end of the runway. In this maneuver a pilot attempts to use as much of the available runway as possible and justifies the maneuver due to shortness of the runway or poor braking conditions. This type of maneuver is not recommended since high sink rates and poor thrust relationships can develop which may cause undershoots or hard landings. The pilot should base his landing decision upon the normal touchdown point from the instrument approach and, if stopping distances are insufficient, proceed to an alternate.

DOWNWARD VISION ANGLE

There is an area which the pilot cannot see from the cockpit because it is hidden by the nose of an aircraft. If a line from the pilot's eye is projected over the nose of his aircraft, this line will form an angle with the horizontal determining the pilot's downward vision angle. The area hidden from the pilot's view can then be determined from a trigonometric relationship based on aircraft elevation and cockpit cutoff angle. An aircraft with a 14 degree downward vision angle 100 feet above the surface will conceal about 400 feet beneath its nose.

Consider an approach in 1600 feet visibility. This means the pilot's visual segment at 100 feet elevation with a 14 degree downward vision angle will be reduced to about 1200 feet. Other factors, such as a nose-high pitch attitude and a slant range visibility less than the RVR, can further reduce the pilot's visual segment.

PILOT REACTION TIME

At 100 feet elevation on a three degree glide slope an aircraft is approximately 1900 feet from the glide path intercept point (GPIP). If your aircraft's final approach speed is 130 knots (215 feet/sec) you have about nine seconds to bring visual cues into the cross-check, ascertain lateral and vertical position, determine a visual flight path and establish appropriate corrections. More than likely, three to four seconds will be spent integrating visual cues before making a necessary control input. By this time the aircraft will be 600 to 800 feet closer to the GPIP, 40 to 60 feet lower and possibly well into the flare. Therefore, it is absolutely essential that you be prepared to use visual cues properly and with discretion during the final stages of a low visibility approach. You must be positive the patterns developing during the visual cross-check are related to the runway environment and that your visual perspective for flight path control is adequate prior to total reliance on the visual information.

CREW PROCEDURES

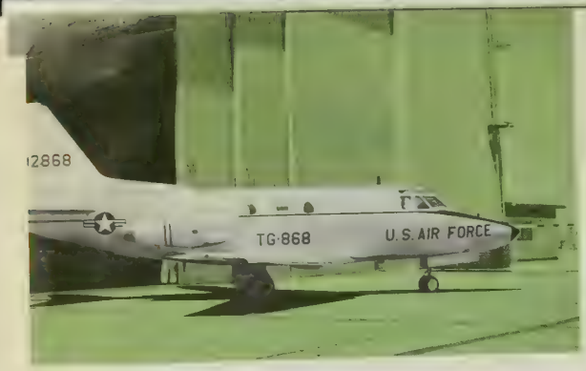
A fully qualified and proficient copilot can be used to assist the aircraft commander in a number of ways. He can fly the approach, control airspeed, be responsible for communications, direct the checklist, perform the missed approach, establish aircraft configurations or any other duties assigned by the aircraft commander. However, it is essential for the copilot to understand exactly what his duties and responsibilities are prior to initiating the approach.

One successful technique has been to allow the copilot to fly the approach, while the aircraft commander makes the decision to land/go-around at decision height, saying either "go-around" or "I have the aircraft." He assumes control if a landing is to be made; if not, the copilot executes the go-around. This procedure has unburdened the aircraft commander, allowing him more time to obtain information from the visual cues for landing.

If the approach is unsatisfactory or insufficient visual references are available to execute a landing at decision height, the copilot, since he is on instruments, is prepared to execute a missed approach on command. If the aircraft commander executes the approach, he may allow the copilot to control power/airspeed until decision height where the aircraft commander assumes control for the landing or missed approach.

Studies of the low visibility landing environment and a series of flight tests by IPIS pilots, in conjunction with the Air Force Flight Dynamics Lab, have been probing a regime of flight few pilots are familiar with. It is immediately obvious that we must thoroughly understand this demanding environment, develop new procedures to cope with it and train crews to a peak of proficiency if we are to progress into regular landings in Category II, and eventually Category III weather. ★





PROPER MAINTENANCE AND OPERATION WILL PROLONG THE LIFE OF

T-39 engines

Maj Ray D. Rittenhouse, Directorate of Aerospace Safety

The T-39A and B airplanes are powered by a pair of Pratt and Whitney turbojet J60-P-3 or -3A engines. These engines have proved their reliability, but field reports occasionally indicate a need for further amplification of maintenance and operational procedures.

At one base, engines were being trimmed for 100 per cent thrust with the throttles full forward against their mechanical stop. When this procedure is used, adequate thrust for takeoff may not be obtainable under certain ambient temperature conditions. At another base, throttle adjustments were not being made during climbs to altitude. This practice can lead to engine overboost. Exhaust total pressure should always be computed periodically during the climb, and the throttles adjusted accordingly.

The J60 engines are defined as "flat-rated" engines and when properly trimmed, military thrust for takeoff will be obtained at something less than the full-open throttle position. The basic design of the fuel controller and the parameters it senses are such that, to obtain the required thrust for the varying ambient conditions, the pilot must have available a range of throttle travel. To produce maximum allowable thrust from the engines, the engines must be properly trimmed.

Engine trimming is a maintenance function performed by adjusting the fuel control. The maintenance trim check, commonly referred to as a "part-power trim check," will permit the pilot to obtain military thrust at less than full throttle under a wide variety of ambient conditions.

The frequency of part-power trim checks is given in the Manual of Inspection Requirements TO 1T-39A-6. The procedures for accomplishing these checks are given in TO 1T-39A-2-2 "T-39A and T-39B Engines and Related Systems," and TO 1T-39A-2-3-1, "T-39A and T-39B Power Plant Ground Operation and Conditioning."

For proper operation of the J60 engine, there are three basic limits which are to be observed: exhaust total pressure (Pt5), exhaust gas temperature (EGT), and RPM. If any one of the three is exceeded, the throttle should be retarded until the engine is again within proper operating range. This is true for both normal rated and military thrust settings.

The Pt5 gages in the cockpit are the primary instruments for setting engine thrust; Pt5 is the measurement of total pressure (just aft of the turbine wheel) in the engine. To obtain the proper Pt5 value, before setting the throttle, use (1) the J201 engine thrust computer, (2) the graphic charts in Appendix 1 of the Flight Manual, TO 1T-39A-1, or (3) the tabular charts in the Pilot's Checklist. The computed Pt5 is just as much an engine "red line" limit as the red line EGT or RPM limit and is normally the first indication you will see as the throttle is advanced.

During a military thrust scheduled climb, if the EGT limit of 677°C is exceeded, the pilot should retard the throttle to lower the EGT as explained in the "Operating Limitations" section of TO 1T-39A-1. When this is done, the EGT becomes the governing limit.

The same would apply for a normal rated thrust scheduled climb; however, excessive EGT at normal rated thrust (over 565°C) is not as detrimental as excessive EGT during military thrust. An engine that has a tendency to exceed its EGT limit before achieving the Pt5 value limit may be malfunctioning because of one of the following: dirty engine (deposits causing hot spots), improperly functioning burner, defective fuel nozzle, broken or out-of-rig bleed strap, or faulty instrumentation. The EGT cannot be decreased by advancing the throttle except, possibly, in the case of an engine with a malfunctioning burner or fuel nozzle (giving a hot spot at some particular thrust setting).

Engine life is shortened by "overboosting." An overpressure or overboost condition can occur when a normal rated thrust or military thrust climb is being performed without the throttle being reset from the initial setting selected for the recommended climb schedule. In such case, temperature variation with altitude change can result in a higher Pt5 than the chart limit. Therefore, it is necessary that Pt5 be monitored during the climb to avoid engine overboost.

When any engine limit is exceeded, the life of that engine is shortened. The amount of harm done depends on (1) which limit has been exceeded, (2) how much it was exceeded, and (3) how long it was exceeded. ★



TRANSIENT MAINTENANCE people on bases throughout the Air Force can be proud of the accident-free flying record being compiled by Facility Checking Squadrons of Air Force Communications Service.

Flying world-wide while checking NAVAIDS and Air Traffic Control facilities, their T-33s, T-39s, C-140s and C-47s are constantly on transient status at the bases they are checking. The 1866th FCS recently completed its eighth year without an aircraft accident since activation in 1962. The 1867th, 1868th and 1869th concurrently completed five straight years without an aircraft accident.

This record attests to not only the excellence of the AFCS aircrews and maintainers, but the general high quality of USAF transient services around the world.

SOME FOLKS just won't give up! Like the C-130 type trying to park in front of the terminal building at a Navy base. Following a marshaller's signals, he started a right turn into the parking place. In the turn it looked like the building was coming awful close to his left wingtip. But another marshaller was out there, watching the wingtip and a drainpipe that protruded from the building. Knowing that these alert troops would stop him if things got too tight, he pressed on.

And soon both marshallers were giving him the stop signal. The lumbering transport continued to move, and both marshallers switched to the emergency stop signal. The NAVY emergency stop signal!

After his wingtip struck the drainpipe, the C-130 pilot decided to taxi on up to the parking place. It wasn't until he'd moved another 30 feet that he took out the second drainpipe.

Then he stopped and shut down.

If you plan to land at a non-USAF field, look up the appropriate signals. FAA, Navy, Army and ICAO stop signals are not the same as ours!

And unless you have really strong feelings about drainpipes, how about just settling for one at a time . . . ?



REX RILEY
Transient Services Awar

LORING AFB	Limestone, Me.
McCLELLAN AFB	Sacramento, Calif.
MAXWELL AFB	Montgomery, Ala.
HAMILTON AFB	Ignacio, Calif.
CHANUTE AFB	Rantoul, Ill.
SCOTT AFB	Belleville, Ill.
RAMEY AFB	Puerto Rico
McCHORD AFB	Tacoma, Wash.
MYRTLE BEACH AFB	Myrtle Beach, S.C.
EGLIN AFB	Valparaiso, Fla.
FORBES AFB	Topeka, Kans.
MATHER AFB	Sacramento, Calif.
LAJES FIELD	Azores
SHEPPARD AFB	Wichita Falls, Tex.
MARCH AFB	Riverside, Calif.
GRISSOM AFB	Peru, Ind.
PERRIN AFB	Sherman, Tex.
CANNON AFB	Clovis, N.M.
HICKAM AFB	Hawaii
LUKE AFB	Phoenix, Ariz.
RANDOLPH AFB	San Antonio, Tex.
ROBINS AFB	Warner Robins, Ga.
TINKER AFB	Oklahoma City, Okla.
WETHERSFIELD AB	England
HILL AFB	Ogden, Utah
YOKOTA AB	Japan
SEYMOUR JOHNSON AFB	Goldsboro, N.C.
ENGLAND AFB	Alexandria, La.
MISAWA AB	Japan
KADENA AB	Okinawa
ELMENDORF AFB	Alaska
PETERSON FIELD	Colorado Springs, Colo.
RAMSTEIN AB	Germany
SHAW AFB	Sumter, S.C.
WRIGHT-PATTERSON AFB	Dayton, Ohio
LITTLE ROCK AFB	Jacksonville, Ark.
TORREJON AB	Spain
TYNDALL AFB	Panama City, Fla.
OFFUTT AFB	Omaha, Nebr.
ITAZUKE AB	Japan
ANDREWS AFB	Washington, D.C.
McCONNELL AFB	Wichita, Kans.
NORTON AFB	San Bernardino, Calif.
BARKSDALE AFB	Shreveport, La.
HOMESTEAD AFB	Homestead, Fla.

experts talk about th

CLEAN OIL SYSTEMS

G. F. Heins, SAAMA (SANTTB), Kelly AFB, Texas

An engine oil system is in some ways similar to the human blood system. Impurities in either will cause serious trouble, so let's look at this vital lifeline for the engine.

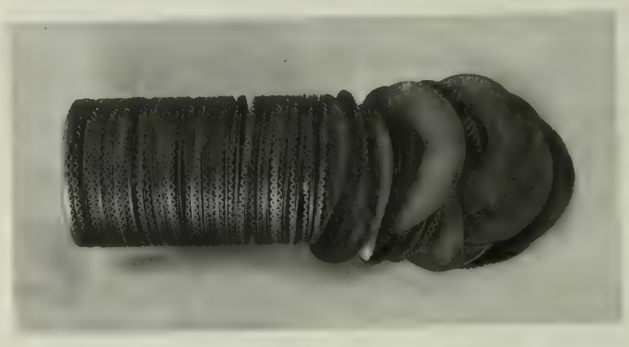
The life of a reciprocating engine is lengthened by using care in starting and taking adequate warm-up time before operation at advanced power settings. It is very important to give all engine parts enough time to expand to designed operating clearances and to permit the oil to heat and thin to the right viscosity. This insures good lubrication, cushioning and cooling.

Proper and continuous lubrication in the cylinder area is particularly important when you consider "piston miles per operating hour." The Air Force has always been concerned with long cylinder barrel life, ring wear, deposits and general engine cleanliness which affect barrel life. Excessive and rapid piston ring wear often develops into ring feathering. Feathered rings result in blow-by which shortens the life of the cylinder and leads to excessive oil consumption.

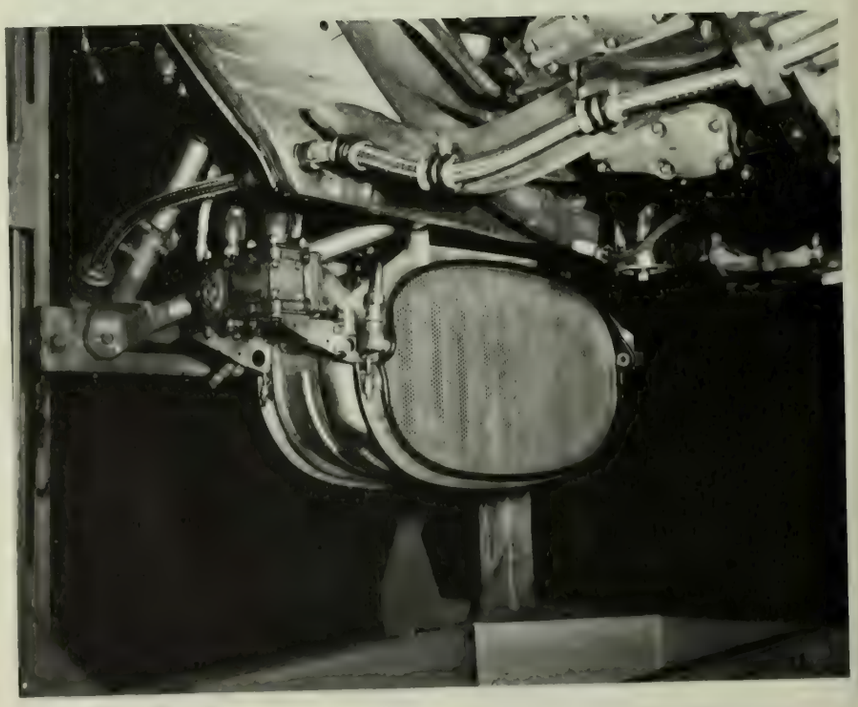
Dirt, sand, dust and other impurities which enter the engine cause damage to master rod and other bearings, as well as the cylinders themselves.

Initial engine runs are extremely important. It is during this wearing-in that ring fuzz is generated from the piston rings. This fuzz damages cylinder barrels, bearings and other close tolerance areas. It will also get into chip detectors and lead to a warning light. When this occurs in flight on a tactical mission, the pilot must jettison stores, declare an emergency and land as soon as possible.

To minimize mission aborts caused by chip warning lights, oil should be changed per TO directions with particular attention to cleaning oil screens. If desired, local inspection criteria may require oil change on a more frequent basis, to eliminate fuzz or dust and dirt from unprepared fields. Oil changes are cheaper than aborted missions or letting harmful deposits ruin engines. ★



Keeping oil screen clean will allow it to function properly.



Clean, unobstructed oil cooler is essential if oil system is to perform effectively.

e round engines PART II

THOSE R-2800 CYLINDER FAILURES

C. A. Saathoff, SAAMA (SANTTA), Kelly AFB, Texas

During 1968 a problem of piston rings scuffing cylinder barrels developed, resulting in many premature engine failures. An investigation showed that oil scraper rings did not have sufficient radius incorporated and that the inadequate radius caused the scuffing. This was noticed primarily during the first hours of operation.

The problem was alleviated by removing all defective rings from stock, vapor honing barrels number 8, 9, 10 and 11, lubricating cylinder barrels and pistons with a mixture of engine oil and an anti-friction additive during assembly, and borescope inspection after test block run.

Cylinder head cracks were the result of cyclic loading and time. (The term cyclic loading is defined as the magnitude [power] of the cycle, frequency of the cycle, and temperature change applications.) From this it can be seen that short missions are harder on engines than long ones. Cyclic loading is at maximum during takeoff when the frequency of the cycles is increased and extreme temperature changes are encountered. Under these conditions, cylinder heads age rapidly.

During overhaul every effort is made to put the newer cylinder heads in the most critical locations on the engine. To detect cracks, engine overhaul specifications were changed to require use of improved magnification equipment on all heads. In addition, specifications now call for new or non-rebarreled cylinders in critical positions such as the numbers 2 and 18 positions on all R-2800 engines and 1, 2, and 18 position on the -99W engine.

Many failures were due to low compression. Therefore, Dash 6 inspection requirements will be changed to require a compression check during each phase inspection. All cylinders having less than 50 psi compression will be replaced. Normal inspection and maintenance still cannot be overemphasized.

Broken cylinder hold-down bolts and studs have been encountered on engines which have been operated beyond Tech Order limits. Many of these failures have been experienced in SEA because of the operational environment and mission requirements. Failures can also result from loose or improperly torqued cylinder hold-down nuts. At the time of overhaul each stud and bolt is checked for stretch and any that are not within specifications are replaced. If a nut is found loose or a stud has failed, that stud and the two adjacent studs are replaced. When more than two adjacent studs have failed, or more than two adjacent nuts are known to have been loose during engine operation, all studs on that pad are replaced. ★

Cylinder compression tests reveal ring or valve failure.





Borescoping is effective method for detecting internal failure.



WELDING SAFETY

Carl S. Norstedt, Directorate of Aerospace Safety

Welding is a process used in day to day repair of Air Force equipment, from planes to PSP. And welders are important people in keeping this huge assortment of hardware moving in the right direction. Most welding is routine — no problem. But occasionally there is an accident. Hence this article.

Welding is required for a variety of items, large and small, involving many different shapes of both ferrous and nonferrous metals. Also the welding torch is used as a cutter. In addition, there are a number of methods, such as oxygen-gas (acetelyne and hydrogen), electric resistance welding using copper electrodes, and arc welding with carbon or metal electrodes. Gas shielding is used to prevent metal oxidation. Extremely high temperatures are involved, up to 9400°F. Obviously, welding is not a task to be haphazardly approached.

Successful welding depends not

only on design considerations, but also on environmental conditions such as accessibility and safety. If the design favors welding as the means of repair, and if the welding can be accomplished in place, this is usually the least expensive and most desirable means.

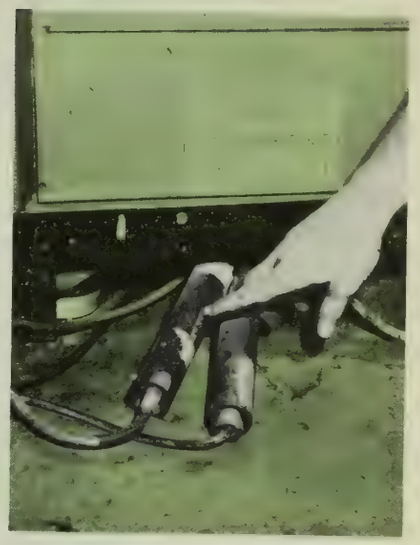
For any type of welding the most serious hazards are the possibility of fire, noxious gases, and physical burns. If the welding must be done at any location other than the welding shop, these hazards must be given full weight in deciding how and where the job will be done. The main concern is, of course, the health and safety of the workers. However, there is also the problem of possible fire damage to the equipment and structure, or damage from an explosion generated directly or indirectly by the welding process. The smaller and more restricted the work area, the greater the possibility of damage and injury.

Injuries commonly seen include eye damage from extremely bright arc flashes or grinding. Hot slag causes burns; respiratory damage may occur from gases and fumes. Hands, arms and legs are subject to cuts from rough or sharp edges, or hands and feet may be crushed by heavy objects. Strains and sprains occur from handling heavy metal items or from falls from ladders and high work places. Head injuries occur in close work areas or during overhead work unless the welder is careful in moving around.

Electric shock is a possibility that is largely within the control of the welder; therefore, it is especially important that he be thoroughly instructed in detail on how to avoid shock. Because welding voltages do not always cause severe injury or shock, they are apt to be handled carelessly. But these voltages are sufficiently high that, under some circumstances, they may be dangerous. Even mild shocks, not dangerous in themselves, from normal working voltages or from high frequency stabilizers, can cause involuntary muscular contraction, leading to injurious falls from high places.

Severity of shock is determined largely by the path and amount of current flowing through the body and this, in turn, depends on the voltage and contact resistance of the area of skin involved. Clothing damp from perspiration or wet working conditions can so reduce contact resistance that an imperceptible current may increase to a value high enough to cause violent muscular contraction that could prevent the welder from letting go of the live part.

The welder should never permit the live metal parts of an electrode holder to touch his bare skin or wet clothing. He should also protect himself from electrical contact with the work or ground with dry insulating material, particularly when working in a sitting or prone position. Dry gloves are also recommended. He should not use electrode holders for manually shielded metal-arc welding without well-insulated jaws in good repair. Electrode holders must not be cooled by immersion in water. Water-cooled holders for gas tungsten-arc and gas metal-arc welding must not be used if any water leak exists.



Poor example! Heliarc fuses should be properly shielded and mounted to prevent damage, assure easy access.

Special precautions should be taken to prevent shock-induced falls when the welder is working

Proper venting is essential for heliarc welding in confined areas.



above ground level. Never coil or loop welding electrode cable around parts of your body. Don't use cables with splices within 10 feet of the holder.

MAINTENANCE

Proper maintenance of arc welding equipment is a must, as are periodic inspections. Report any equipment defect or safety hazard to your supervisor and don't use unsafe equipment. Repairs should be made only by qualified personnel.

Rotating and moving components should be kept properly lubricated. Work and electrical lead cables should be frequently inspected for wear and damage. See that cables with damaged insulation or exposed bare conductors are replaced. Joining lengths of work and electrode cables should be done by use of connecting means specifically intended for the purpose. The connections must have insulation adequate for the service conditions.

PROTECTION OF THE AREA

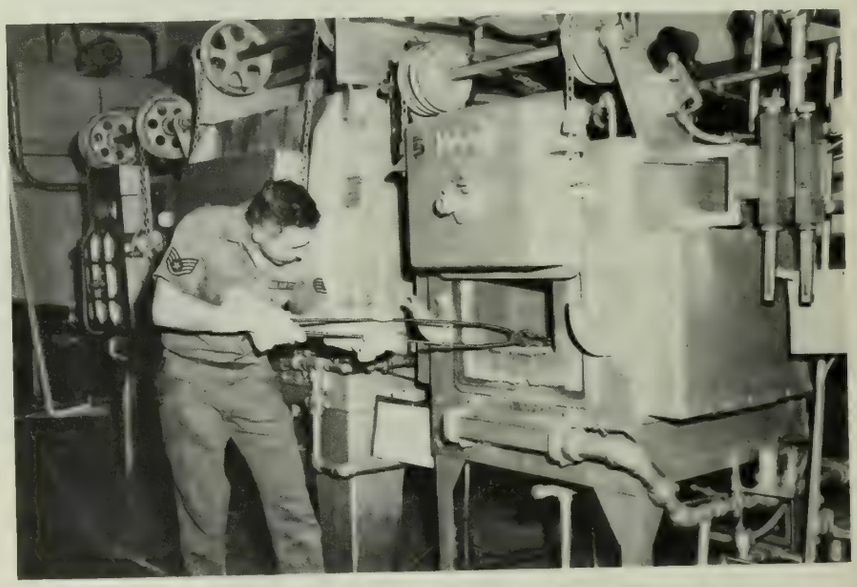
Detailed written procedures should be prepared to cover handling of flammable materials. (Some areas to be covered are the use of explosimeter tests, blanking off main line connections, providing for fire extinguishers, and leaving vessel joints open to the atmosphere.)

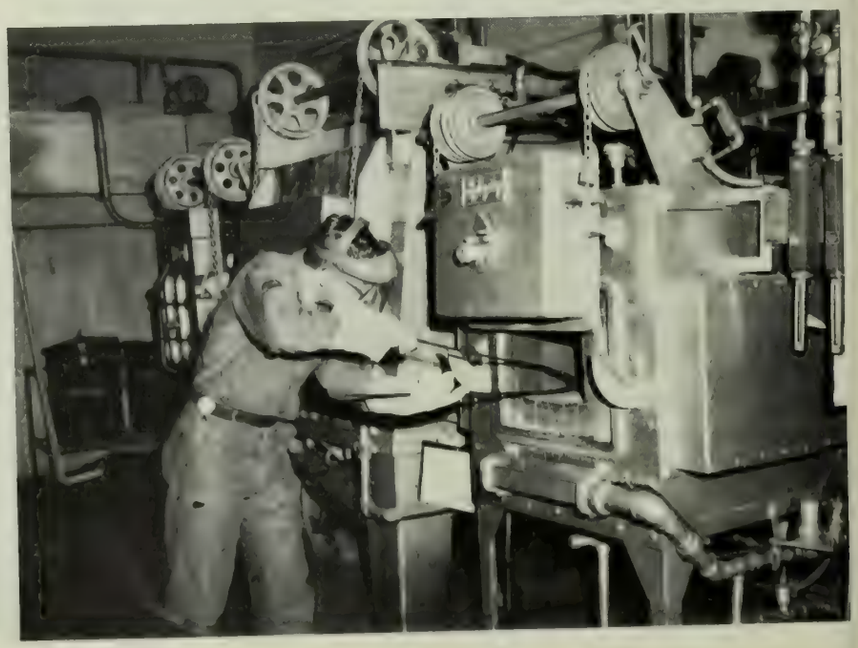
The necessary welding blankets should be strategically located, and any vessels and open lines should be purged as required by applicable safety codes. Cylinders should be secured to carts, walls or structural posts.

Good housekeeping demands the use of warning tags to prohibit use of oil or grease on oxygen cylinder mechanisms. Don't permit anyone to handle cylinders with greasy hands, gloves, clothing, or tools. Hose lines must be kept off the floor or ground, away from oils and possible damage. Pressure gages, hose lines, and connections should be inspected regularly.

For portable operations a fire watch should be posted and equipped with necessary extinguishing aids such as water, sand, and the proper type of extinguishers. He may need to remain at least an hour after the job is completed and check periodically thereafter.

Carelessness and ignorance in welding can and has caused catastrophes. But with proper supervision and controls, welding can be a safe operation. ★





Removing item that has been heat treated from furnace. Note man in lower photo is wearing long sleeves, mask. SSgt in upper photo is unnecessarily risking injury.

Toots



is interested in your problems. She spends her time researching questions about Tech Orders and directives. Write her c/o Editor (AFIAS-E1), Dep IG for Insp & Safety, Norton AFB CA 92409.

Dear Toots

I am perplexed, please help me out. I am an instructor in the Aircraft Maintenance Officer Course at Chanute AFB. I teach the 781 series forms. Recently, through the grapevine and AFR 0-9, we learned of a new form, the AFTO 781M. I have several questions which you may be able to assist me with.

First, why are we in Air Training Command not informed of pending changes in forms, TOs, etc., and given the philosophy behind the change? The initiation of the 781M is just an example of what seems to be a recurring situation. The first example was the AFTO 781B when it was replaced by the AFTO 781J and AFTO 781K. We were not provided with any advance notice hence were in a "fog" for a while. Now we have the 781M. Why? What do we place in the rear cover of the aircraft forms binder now, the AFTO 781M or the AFTO 781G?

Is there any way a better information flow can be achieved between the origination of the revised forms, TOs, etc., and people here at the Aircraft Maintenance Officer Course?

Teach

Dear Teach

You are in a quandry!! I agree—it would seem that the Training Command should be consulted prior to any change to an AFTO form, especially if it is a form that is being taught. However, I suggest that you have your Publications Distribution Officer get the Publication Bulletin (P.B.) for you. It is distributed weekly and lists all new and/or revised forms along with their intended purpose. New forms usually appear in the P.B. 30 to 60 days prior to distribution.

In reply to your second question, the 781M is a new form and does not replace the 781G. Its purpose, as stated in the P.B., 2 May 1969, is to record status symbols, system numbers, and system titles to be used to record data pertaining to discrepancies encountered during flight to support the AFM 66-1 Data Collection.

Toots

EXPLOSIVES SAFETY

FOR SUPERVISORS

IT IS axiomatic that you do not assign a person to work on an aircraft unless he is qualified to perform the task assigned. Yet accidents and hazardous incidents continually occur because someone did not follow this precept.

Case in point: An airman was sent to place a cushion in the rear seat of a T-38. The canopy was closed and, not knowing his business, the man thought the way to open it was by pulling the external jettison handle. When he did, the canopy jettisoned.

Moral: Supervisors who make assumptions while making assignments can expect trouble.

MA-4A BOMB RACKS

RECENTLY an F-100 activity started having difficulties with its MA-4A practice bomb racks. Although everything appeared in working order before takeoff, the pilots were unable to get bombs to release from the racks. The rack electrically unlocked in each case, but the mechanical locks did not release and the hooks did not open. When two of the racks were submitted to the AMA for investigation, it was discovered that the hooks released sluggishly. A load of 10 to 15 pounds was required to open the hooks. These hooks should snap open when the rack is in good condition. It didn't take long for the investigators to determine that the hooks were sluggish because the racks were dirty.

Functional checks of the racks need to be emphasized. If the hooks don't snap open when they're released, either the mounting bolts have been overtightened, or the racks are dirty. Training and supervision can quickly eliminate both these causes for malfunction.

STATIC CHARGES

MUNITIONS PEOPLE in a SEA unit recently were surprised to find that a static electric charge had built up on adapter boosters they were unpacking from foamed plastic containers. During unpacking, handlers were receiving discharge sparks up to three-eights inch long.

Apparently the static charges were built up when items shifted within the packing containers during the shipment.

On the same base, similar static charges were noticed when ATU-35A/B arming vanes were being unpacked. Since these vanes are non-explosive items, the main damage would probably result from the handler receiving a charge, making an abrupt motion and dropping the item.

Also when the ATU-35A/B arming vane case lid was removed, gas under pressure was heard to escape and ignition of the container occurred. The container is made of foamed plastic sealed in barrier paper inside a pine box.

An ALSAFECOM message from the Directorate of Aerospace Safety recommends discharge of static electricity when a charge is evident or suspected and that the contents be grounded. Also individuals should discharge themselves or equalize their static potential to that of the explosive item being handled.

DANGEROUS SOUVENIRS

AN AIRMAN attempted to fabricate a souvenir ashtray by soldering a "live" 20mm HEI projectile to a used 20mm cartridge case. The intense heat of the torch detonated the projectile. The airman received minor injuries.

This airman had been personally warned of the hazards of collecting and altering munitions for souvenirs, in addition to periodic warnings via bulletin boards, etc.

In a similar mishap a sergeant obtained a 20mm shell which he planned to make into an ashtray. Working at his desk, he sawed the cartridge in half and poured out the powder. Then he went to work with an electric drill. While drilling through the base of the projectile it exploded, severing part of his left hand and causing facial injuries. The explosive was detonated by heat from the drilling process, not from actual penetration of the drill bit.



The admonitions on the sign over the sergeant's desk, shown in the accompanying photo, obviously did not overcome his ignorance or his carelessness.

FALLING FLARES

EVEN THOUGH the loading crew was adhering strictly to established procedures, they allowed a MK-24, Mod 4 flare to slip while loading SUU-25B dispensers. The flare fell and actuated causing damage to adjoining dispensers and flares. The 16°F temperature may have contributed, although the crewmembers were wearing gloves.

The crewmember involved thought the flare was inserted far enough to keep it from falling. It wasn't. As a preventive action, the unit built a table containing an extension of the chute which would aid in positioning flares for insertion and also prevent flares from falling.

SOUVENIRS AGAIN

DESPITE RESTRICTIONS and continuing education against individuals carrying explosive souvenirs aboard aircraft such incidents still occur. Most recent case involved two MK-1, Mod 2 illuminating grenades that were found on an aircraft carrying passengers. One grenade was found just prior to taxi for takeoff, the other during an ensuing search by EOD personnel.

The possible consequences of carrying explosives of this nature aboard passenger-carrying aircraft are extremely serious. Continuing education by supervisors is essential, along with the exercise of common sense on the part of anyone contemplating such an action.

WHO IS MIKE?





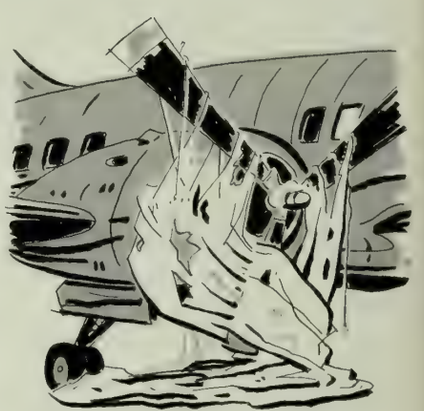
WHO'S RUNNING THE STORE? The crew of two, an IP and pilot, were taking off in an O-1 when the small bird wanted to go to the left. The pilot got it straightened out, but the bird was determined to go left so he used right brake. The IP (in the back) thought, enough of this, and decided to abort as the aircraft neared the left edge of the runway. He pulled off the throttle, applied right brake and rudder but failed to mention this decision to the pilot. The IP's throttle pulling had no effect and the bird continued along the runway shoulder, left gear in the grass. Finally they got back on the runway and both pilots saw that they were pretty well aligned, with the aircraft beginning to show a tendency toward a right turn.

The pilot, seeing that his air speed was between 35 and 40 knots, got off the brake and tried to continue the takeoff. He had a little problem, though, because his friend in back had both of his boondockers on the pedals. From there to where the O-1 left the runway, its motion could be traced by the prominent black rubber marks on the pavement.

Finally the bird went off the side down a slope, into a marsh where it dug in and flipped onto its back. The pilot promptly egressed, but the IP, trying to go out through the rear side window, got hung up by his back type parachute. He finally got out and both pilots walked away without serious injury.

The Board considered many things, including the effect of turbulence from the rotor wash of a helicopter, the existing crosswind, the flight controls, brakes and engine and could find nothing. They finally concluded that the pilot contributed because he was slow in taking corrective action to keep the aircraft properly aligned with the runway. The primary cause, they said, was the IP who was determined to abort but didn't tell the pilot who was equally determined to take off.

FOD FOR THOUGHT. Most FOD stories are written about, or for the benefit of, maintenance people. Here's an item with a little different twist. The crew landed their F-4, went through the de-arm area and pulled up at the hot refueling pits for a bit of petrol. After taking on a load, the pilot added power to move out, but the RPM and EGT failed to rise and the left engine started vibrating. They shut it down and discovered that the ejection seat pin bag had fallen out of the cockpit into the left intake when the canopy was raised during taxi. Apparently during ACM the bag was dislodged from its stowed position, and the crew forgot to check for it prior to opening the canopy.



DRAGGED CHUTE. As the Air Evac crew turned off the runway after landing, their landing lights illuminated an object on the pavement in front of them. Immediate braking action brought the C-131 to a stop just short of the object—a drag chute left there by a fighter aircraft. While the pilots were in the act of shutting down Nr 2 engine, the chute billowed up in front of them. Helpless, they watched the shroud lines tangle in the propeller, and the heavy at-

achment fitting swing up and impact against the fuselage. The damage required 100 manhours to repair.

The drag chute had been on the taxiway for about 17 minutes. That's not excessive on a busy airfield, but someone on the airfield should be responsible for retrieving drag chutes as quickly as possible. At night, it helps to tell Ground Control where you dropped your chute. (Off the taxiway, if possible!)

But the primary lesson for pilots is that whenever you see an object in your taxi path that could be sucked into propellers or intakes, stop *well* short of it. If hard braking is required, use it.

TRIM. Although it could happen in any fighter aircraft, severe touchdown at the time of ejection has been reported on three occasions during low altitude escape from the F-106. In the most recent case, the pilot found his engine had flamed out when he rolled wings level on downwind for landing. After three unsuccessful airspeed attempts, he released the control stick and reached for the ejection handles. The aircraft pitched approximately 50 degrees nose-down and he was ejected in a horizontal trajectory at about 800 to 900 feet above the ground. His parachute streamered and he impacted in soft, marshy terrain. The soft landing saved his life. The two previous pitch down ejections ended in fatalities.

Failure of the chute to open was caused by a malfunction, but it is problematical whether a properly functioning parachute would have had time to decelerate the pilot under the conditions of the horizontal ejection. Investigators theorized that when he ejected the pilot most likely had not trimmed out nosedown aerodynamic forces as he decelerated in the break to about 190 knots, with the gear down.

SPEAK UP! A recommendation which followed a SEA F-4 accident could well be applied to all aircraft carrying more than one crewmember:

" . . . Normal Procedures, Descent, should be expanded to include: 'Prior to starting an approach, the minimum indicated altitude for the approach will be announced by the Aircraft Commander and acknowledged by the other crewmember.'"



SEEING IS BELIEVING. Case history in point—recently, an F-4 type flying machine had a head-on with a B-I-R-D. Although the bird came out on the short end, it successfully penetrated the windscreen depositing fragments in both cockpits. The starboard engine was also *fodded.*

But another event took place that should never have occurred, or at the very least could have been effectively minimized. *Both crewmembers were injured as a result of neither having his protective helmet visor down.*

It's true that hindsight is a heapsight better than foresight. But if you are interested in protecting your eyesight, then make sure you have the dual visor assembly installed, and take that extra second or two to lower your visor before you leave the chocks.

(Reprinted [verbatim] from USN CROSSFEED)

SAFETY SURVEY DISCREPNACIES. One major flying command reviewed the safety survey discrepanies which occurred most frequently on its bases during 1969. Many safety management lapses on their list could have been observed at bases in any command.

- Distribution of safety educational material within the maintenance activity was unsatisfactory.
- Aircraft fuel sampling was not being conducted as outlined in aplicable TOs.
- Aircraft were on jacks in the Maintenance hangar without proper warnings posted.
- Maintenance preflight work cards were not being correctly followed by personnel performing preflights.
- Crash grid maps were not standard nor were they being reviewed annually as required.
- During engine maintenance, fuel and oil lines were not being capped.
- Unauthorized obstructions were located in airfield lateral safety zones.
- Violations of AFM 86-8 were not identified and covered by waivers.
- Excessive number of persons were authorized to sign off red cross items.
- Erosion was observed in runway shoulder areas.
- Static grounds on ramp were overdue inspection.
- Oxygen mask washing facilities in PE areas were inadequate.

MAINTENANCE briefs

soap is great, but . . .

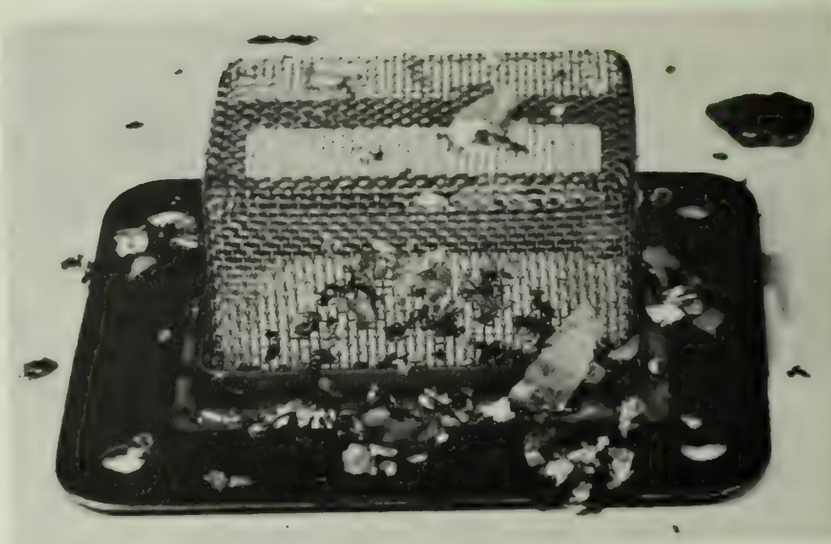


MOST DEFINITIONS of SOAP (Spectrometric Oil Analysis Program) include a statement similar to the following: Submicroscopic particles of metals are worn off contacting surfaces and are gathered and held in suspension by the lubricating oil. Now keep that in mind.

A J79 engine was removed from an airplane for P.E. The scavenge filter and the transfer gearbox magnetic plugs and screen were removed and found covered with large particles of metal. The oil jet for the Nr 3 bearing had small shavings in the orifice. The entire oil system was found to be contaminated.

Note again that this was found during a P.E. The engine had apparently been running satisfactorily with no signs of any difficulty. But why was the contamination not found during the routine SOAP examinations?

Look at the pictures and remember what was said in the opening paragraph — submicroscopic particles suspended in oil. The junk in this lube system was too heavy to be suspended. It just gathered in the filters, screens, and lube jets, and on magnetic plugs.



Was there a way to tell that the system was contaminated? We have no way of telling for sure, but there's a good chance that oil pressure may have been higher than normal.

At any rate, don't put all of your eggs into one basket. SOAP is great, but it doesn't show up all forms of contamination. Watch the gages and check the filters and screens. (GE Jet Service News)

WHO IS MIKE?





f-4 fuel system "weirdo"

Maj Raymond C. Ramsey, Directorate of Aerospace Safety

AFTER 40 MINUTES of normal flight, an F-4 aircrew was astounded by a fuel low level warning light. Fuel at this time was a healthy 4800 pounds over 5500 pounds with no indications of any malfunction. A quick feed tank check confirmed the low level light with a reading of only 900 pounds. A very wise aircrew promptly landed at an auxiliary airfield without incident.

Maintenance investigators traced the malfunction to a faulty check switch for the number six tank transfer pump. This switch is located in the left wheel well and is spring loaded to the OFF position. Seems the spring broke and the switch remained unnoticed in the CHECK POSITION. This condition closes the number one and two transfer level control valves. The only method of obtaining fuel, then, is by gravity feed. External and internal wing fuel will transfer normally to the fuselage tanks and then by gravity to the feed tank.

This may seem like an isolated case, but "for the want of a nail"



someone missed the boat

Immediately after takeoff a C-135 crew experi-ced control problems. After gear and flaps had en retracted, gradually increasing right control heel pressure was required to maintain straight and vel flight. Control response to the right was very or. At times the control wheel would have to be ked before the pilot could get any response. The tboard spoilers were observed to be operating erat-lly and would occasionally stick in the up position. times they would not extend at all. The inboard oilers would raise only a few inches when a right rn was made and at times would not raise at all. A t turn was normal except for a slight tendency for e aircraft to roll left. The outboard spoiler switch as placed in cut-off and the outboard spoilers were served to be working intermittently. When the speed brakes were raised to 40 degrees and the outboard spoiler switch placed to cut-off, the outboard spoilers remained up. This procedure was followed again and the spoilers worked normally. Several additional repeats produced the same inconsistent operation.

A control check at 13,000 feet showed approximately five degrees of right control wheel deflection was required to maintain wings level at approach and touchdown speeds. The aircraft was landed with 40 degrees of flap without further incident. Investigation revealed maintenance had replaced control system cables 14, 15 and 16, due to corrosion. After replacement of the cables the spoilers had been improperly rigged. Maintenance missed the boat by not following tech data.

MAINTENANCE briefs



7/16 inch —big difference

A C-141 PILOT write-up indicated an elevator trim malfunction that required excessive back pressure to rotate during takeoff and to maintain climb to 300 feet. Normal nose down trim immediately after liftoff was not required. He landed the big bird at his first stop, using 4.5 units nose-up trim which was considered normal. The next takeoff required the same excessive back pressure for rotation and climb to 300 feet. After he landed at his next destination, Maintenance investigated the problem and found the elevator rigged 7/16 inch down from neutral. After rerigging, an FCF indicated the system was okay. How did the elevators get 7/16 inch out of rig? There is a maintenance man somewhere who has the answer.

shimmy

AFTER AN F-100 aborted because of nosewheel shimmy, Maintenance found that the nose gear scissor link pin was missing. It was found on the runway, 1600 feet from the start of the takeoff roll. The pin was improperly installed and neither the pilot nor maintenance man found it in the walk-around. This sort of thing makes an impression on pilots (they are riding in the airplane) and this pilot will undoubtedly remember this item from now on. But what about the Maintainer? How do we insure his attention to such details?



everybody knows...

WELL, ALMOST everybody. It was just a minor accident, but with the half-a-hundred passengers aboard and circumstances slightly different, it could have been a major catastrophe.

The C-130, landing out of a night GCA approach, touched down right gear slightly left of the centerline because of the crosswind. As the pilot corrected back toward the centerline, the left outboard engine struck something. The prop ripped off and the fuel tank was punctured, which started a fire. The crew got the airplane stopped and the passengers out. The fire department was on the ball and quickly extinguished the fire.

The object the engine hit was a forklift parked about one foot from the edge of the runway. Its headlights had been used to light the M-21 barrier, which was being repaired. The tower had been informed that the forklift was clear of the runway. It was—12 inches. Apparently EVERYBODY DOESN'T KNOW that you don't park vehicles on the edge of the runway. ★

U. S. GOVERNMENT PRINTING OFFICE 1970-391-397/8

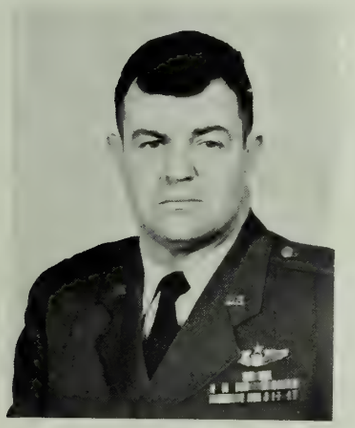
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Presented for outstanding airmanship and professional performance during a hazardous situation and for a significant contribution to the United States Air Force Accident Prevention Program.

Major George W. Cowgill

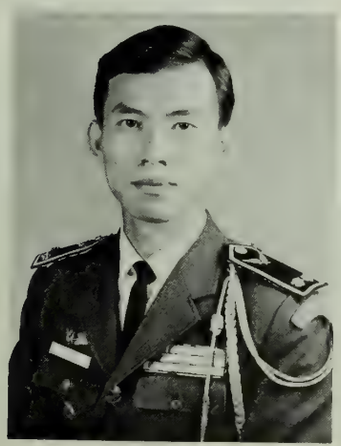
APRFE Detachment 1,
APO San Francisco 96340



On 2 May, 1969, during a functional check flight in an F-100D aircraft, Major Cowgill experienced serious flight control difficulties when a stabilator bungee failed shortly after takeoff. Major Cowgill suddenly found that he could not move the stabilator. The control stick would not move fore and aft even when he applied maximum pressure with both hands on the stick. Using stabilator trim and throttle, he was able to continue to climb, turn to avoid overflying the city of Tainan, and level the aircraft. He established an orbit over water while he discussed his problem with ground personnel, but no one was able to offer a solution. Although it was suggested that he abandon the aircraft, Major Cowgill performed stability checks with speed brakes and landing gear extended. Satisfied that he could control the aircraft, he flew a series of simulated landing patterns at 10,000 feet to determine the amount of trim and power required for safe approach speed and descent rate. Taking into account the 10,000-foot runway available and the presence of a BAK-12 arresting barrier, he decided he had sufficient safety margin to attempt a landing. He used trim and power to set up an 800-foot-per-minute descent on a straight in approach, then increased power one-half mile from the runway to decrease his descent rate to 400 feet per minute. Taking advantage of ground effect to assist in roundout, he touched down smoothly, 1500 feet down the runway. Major Cowgill's calm application of professional skill and knowledge, and his careful analysis of this serious emergency enabled him to save a valuable combat aircraft. WELL DONE! ★

1 Lt Nguyen V. Tam

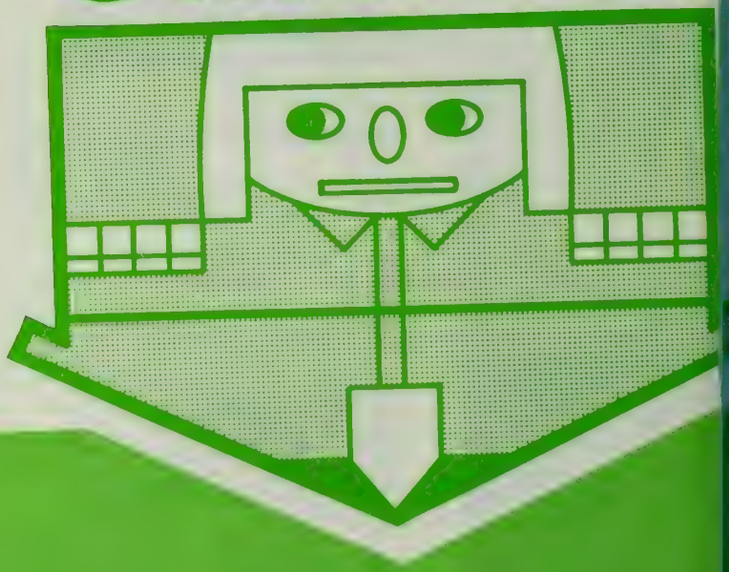
RVNAF
4441 Combat Crew, Training Squadron,
Williams AFB, Arizona



During takeoff roll, the right engine of Lieutenant Tam's F-5 caught fire. He climbed to a safe ejection altitude, analyzed the engine instruments, and then retarded the right engine to idle. His aircraft was configured with a centerline fuel tank which should have been jettisoned, but no jettison area was readily available. Rather than jettison the fuel tank over a populated area, he immediately prepared for a single-engine, heavy-weight landing. Executing a perfect approach and touchdown, Lieutenant Tam was able to stop well before the end of the runway, thus preventing further damage to the aircraft. Lieutenant Tam's accurate and level-headed assessment of this emergency plus his professional airmanship reduced a potential hazard to a routine precautionary landing. WELL DONE! ★



HOW'S YOUR SHAPE?



EVELYN LUNDE

IF YOU LIKE MINE TRY AEROBICS

29.1305
FLYS

UNITED STATES AIR FORCE • MAY 1970

Aerospace SAFETY

FOR AIRCREWS, MAINTENANCE & SUPPORT TECHNICIANS



44 phantoms

UNIVERSITY OF
JAN 14 19

Aerospace SAFETY

FOR AIRCREWS, MAINTENANCE & SUPPORT TECHNICIANS

MAY 1970 AFRP 62-1 Volume 26 Number 5

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SOME CHANGES ARE BEING MADE



IN Aerospace SAFETY

LOOK FOR THE JUNE ISSUE

WITH

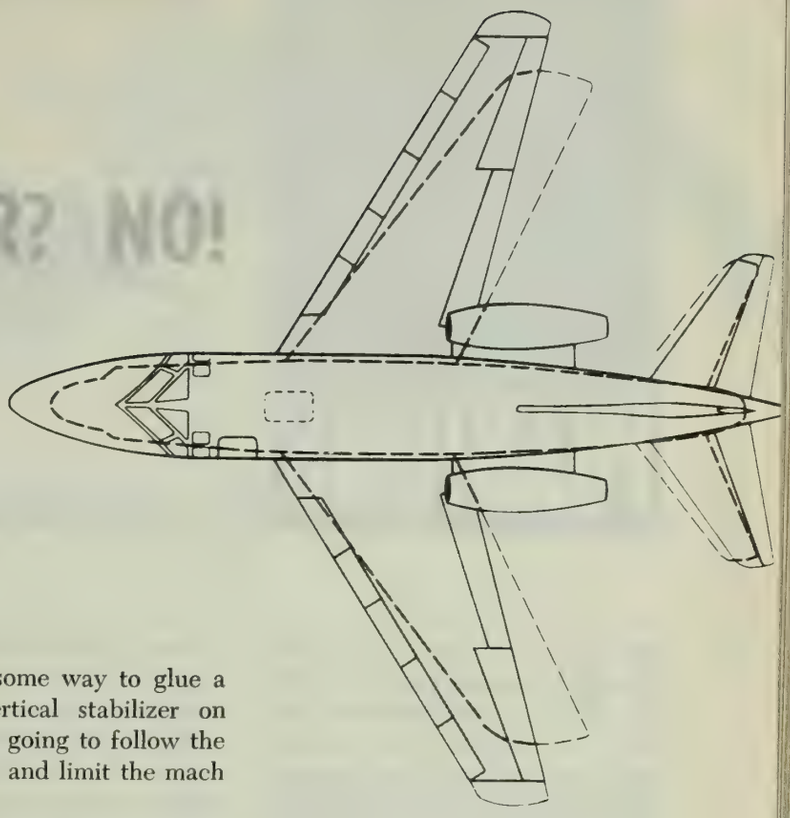
• NEW FEATURES
• NEW LOOK

AND

• MORE PAGES

F-86? SABRELINER? NO!

IT'S A T-39



Maj Ray D. Rittenhouse, Directorate of Aerospace Safety

Two fighter pilots were watching a T-39 on its takeoff roll and their conversation went like this: "Isn't that just purty, takes off short and hot just like our old 86s."

"Yeah, and they land like 'em too. Great airplane, similar in many ways; why, look at that wing, it's our Sabre all over again."

A clear case of mistaken identity.

Here's another case. The other day a pilot started the T-39's flaps down at 210 KIAS. The instructor in the right seat immediately stopped the flaps and asked a simple question: "What is the maximum allowable airspeed with the flaps extended?"

"Sure I know the flight manual says 180," was the reply, "but, the *Sabreliner* can go 225 with 60 per cent flaps — same airplane, you know." Well, North American reps say they can modify the T-39 flap actuating system to *Sabreliner* standards; however, until then the limit is 180 KIAS.

How about this one? The thickness of the T-39 fuselage skin was trimmed down to give us a lighter airplane. Would you believe the skin is some thirty thousandths of an inch thick while the *Sabreliner* skin remains at fifty thousandths? This leads up to the limiting mach. *Sabreliner* pilots can run up to .82 mach, but until we, among other things, figure some way to glue a *Sabreliner's* vertical stabilizer on our bird, we're going to follow the T-39 handbook and limit the mach to .77.

The word steadily spreads that the T-39 is nothing but a *Sabreliner* or modified F-86. Some pilots actually believe that the T-39 was manufactured with an F-86 wing, and that consequently, it can be subjected to jet-fighter type maneuvers and G-forces. Among these believers could be some of the aircrews flying T-39s who perform 360-degree overhead maneuvers in the landing pattern; if they rack the airplane hard, they can exceed the G-limit. This fighter-type maneuver in itself is not harmful to wing or fuselage IF the G-limitations are observed.

The T-39 and F-86 wings do look alike in profile, but that's where the similarity ends. The T-39 wing and fuselage are designed to sustain the loading conditions experienced by a transport-type airplane, not the violent maneuvers of a fighter type. The amount of material needed in the wing structure to sustain the loads imposed by high G maneuvers just does not exist in the T-39 wing, and if it were subjected to greater than the recommended G-loads, the wing as well as the fuselage could fail.

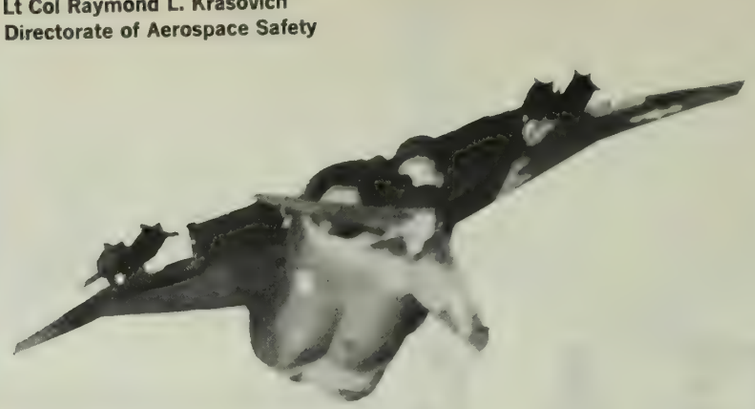
It is always good advice to know the airplane you are flying, to watch the accelerometer, and to observe all limitations spelled out in the Dash One. These include limiting mach .77, or 350 KIAS, prohibited maneuvers and maximum allowable airspeeds for lowering the gear and flaps, 180 KIAS.

The point of all this is very simple. The T-39 may look like, feel like and fly like something else but it's still a T-39. The little bird is going to be around for a long time and it's getting a lot of hours on it. The fleet is averaging approximately 8000 hours per copy. Several birds have exceeded 10,000 hours and the engineers tell us it's a 15,000 hour airframe.

The operating limitations spelled out in the Dash One are directive by nature. Let's not lose a bird just because it looks like a *Sabreliner* and flies like a *Sabre*. ★

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Lt Col Raymond L. Krasovich
Directorate of Aerospace Safety



that's the number of US

F-4 out-of-control accidents have been a thorn in the commander's side since 1965, and the situation has not shown a great deal of improvement over the years. Of course, when you use a big, heavy, high performance, multi-missioned aircraft with an infinite number of configurations in a tactical fighter role—as the old heads say, "You gotta expect trouble!"

Well, that is probably true to some degree. Some aircraft accidents are bound to occur until we've taken care of all the cause factors. But surely not forty-four F-4s! That's right, forty-four USAF F-4s have been lost in out-of-control accidents (pilot factor, not including other cause factors) since the aircraft has been in service. When you think about it, that comes to a pretty respectable strike force.

The problem has existed throughout the life of the airplane. It really reared its ugly head in 1967 when the Air Force lost 16 F-4s in out-of-control mishaps. These losses triggered a Directorate of Aerospace Safety study in an effort to cut down this unacceptable loss rate. The study culminated in a briefing to the Chief of Staff in 1968 and the subsequent formation of a General Officers' Review Group. This group, consisting of general officers representing all commands involved with the F-4, first met in September of 1968. It reviewed the problem in depth and made recommendations toward a solution. The users, fixers, testers, designers and buyers were all represented. After viewing the problem from all angles, the group determined from test data that the aerodynamic stall warning of the F-4 was inadequate, not well defined, and aggravated by certain external store configurations in combination with CG location.

At the same time, the using commands began to take a close look at their training programs. They began to place more emphasis on aircraft handling qualities. Weapon delivery procedures were modified to insure that delivery patterns stayed within a safe operational envelope. Defensive and offensive combat maneuvering programs were revised. More training time was devoted to aircraft handling, including a learn-to-fly phase prior to the tactics application.

Flight Manual descriptions of stall characteristics and general handling qualities were revised to reflect the latest test and operational data. All of this was supplemented by various command messages and correspondence, which at times must have appeared to the hapless jock as an unending avalanche of paper.

Investigation of ways to improve the natural stall warning characteristics included more wind tunnel testing and investigation of such gadgets as stall strips, different tails, strakes, fences, and a number of other aerodynamic fixes. None of the fixes which showed promise were practical, such as turning the entire tail assembly upside down.

One interesting fact that was discovered in the tunnel was that directional stability deteriorated from a positive to a negative value at about 24 units angle of attack (AOA). This is seen from the cockpit during an approach to a stall as nose slicing. Again, there was no practical way to eliminate this phenomenon.

After considering all of this information, it was obvious that a major redesign would be the only way to improve the natural stall characteristics of the airplane. Efforts were then directed toward development of artificial stall warning devices, along with a deep stall flight test program with an instrumented F-4E. The artificial devices which looked most effective were a stick shaker with a pitch rate input, installation of a ree



ls lost in out-of-control accidents

ockpit AOA indicator, a new AOA presentation and relocation of the ront cockpit instrument, and the ural stall warning system.

After considerable effort, the tick shaker was discarded since its peration was not compatible with he stick force transducers.

An extensive look was taken at a ew AOA indicator as well as sev- ral different locations for the tandard gage. Neither of these xes had the desired pilot see- bility so the efforts were curtailed. long these lines, the present AOA ndexer lights have been modified o operate continuously. This roved to be an effective visual resentation of AOA. AOA instru- ents for the rear cockpit are eing procured and installation is nderway. The aural tone warning ystem has been installed in pro- uction aircraft since August 1969 nd kits for the remaining aircraft re being issued.

The deep stall test program got nderway in December 1969 and is xamining thoroughly the ragged dges of the F-4 flight envelope. arious external stores and CG ocations are being tested. This rogram should give us a better dea of exactly what phenomena re encountered as well as the ffectiveness of the present out-of- ontrol procedures.

Now that you are filled in on what has taken place, you are probably wondering if all the effort is justified. First, let's look at the record.

The problem started in 1965 when we lost two F-4s to out-of-control accidents. The picture since then, comparing out-of-control accidents with total major F-4 accidents, is presented below.

YEAR	LOSS OF CONTROL	TOTAL MAJOR	PER CENT
1965	2	15	13.3
1966	6	31	19.4
1967	16	67	23.9
1968	7	50	14.0
1969	11	41	26.7
1970 (Jan)	2	5	40.0

In 1968, for some unexplained reason, the number of loss-of-control accidents dropped. However, this trend was short-lived and things were back to normal in 1969.

These accidents were examined in detail to see if any common set of circumstances was responsible for the losses. Thus far, there has been very little commonality. Aircraft external loads, CG location, entry conditions, all varied considerably. So did the model: F-4Cs, Ds and Es, and the RF-4 have all bit the dust due to loss of control.

Where have these accidents been happening? Here is a breakdown by phase of flight.

Traffic Pattern	4
Takeoff	4
Asymmetric Loads	5
ACM/ACT	6
Ground Attack Maneuvers	8
Maneuvering Flight	10
Join-ups	4
Other	3
	44

Now, let's take a close look at the accidents in each phase of flight where losses have occurred.

TRAFFIC PATTERN

The traffic pattern accidents occurred during the pitchout for landing. The airspeed at the break was reported as 280-300 KCAS and the altitude about 1500 feet AGL. As the pattern progressed, airspeed bled off. Angle of attack increased to aircraft buffet and lateral instability. Finally adverse yaw caused by use of aileron to control bank angles led to the loss of control. Ejection results were poor. The low altitude usually precludes recovery attempts, and crew survival from such situations depends on a timely ejection.

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a significant factor in these losses is that in these 44 bashes the flight manual out-of-control procedure was not used once!

TAKEOFF

Two takeoff accidents occurred when the landing gear failed to retract and the aircraft commander became so engrossed in the gear problem he let the airspeed decay to the point where the F-4 stalled, control was lost and the crew ejected. The other two accidents resulted during attempted no-flap takeoffs. In both cases overrotation caused the aircraft to become airborne in a stalled condition, and control was lost.

A crewmember survived one of these crashes and was able to relate the sequence of events. The F-4 exhibited all of the classic stall characteristics — buffet, wing rock, pedal shaker and nose slicing, before the rear seater ejected. In addition, the aircraft commander was aware of the over rotation hazard involved. He expressed confidence in his ability to fly out of such a condition if he should have to, since he had seen a film of this being done at Edwards AFB during the test program. There were some big differences, however; in addition to a big bag of luck, the F-4 at Edwards was clean while this particular one had three full external tanks!

ASYMMETRICAL LOADS

Aircraft lost due to asymmetrical loads include three that had an outboard external tank fail to feed. One entered a rolling spiral from which the aircraft commander could not recover. The second also entered a rolling spiral when the AC initiated a climbing turn into the heavy tank. As the airspeed decreased, lateral control was lost and the aircraft entered a diving, rolling spiral. The aircraft commander was unable to regain control and the crew was forced to eject. Another F-4 crew entered the pattern and pitched out into a full tank. The AC lost lateral control and again low altitude prevented recovery or escape.

As all you F-4 drivers know, this business of one external tank failing to feed is an insidious trap. There is no good way to really know when both externals are dry. Timing their feed time, checking panel lights, checking aileron trim, and rig checks, are all methods that are being used to determine if both 370s are empty.

Another aircraft was lost when the aircraft commander initiated a go-around with 1800 pounds of unexpended ordnance on an outboard station. He retracted the gear and flaps and started a brisk turn into the heavy wing. He lost control and the aircraft crashed. The remaining F-4 was lost when both generators dropped off the line on takeoff. The gear could not be retracted and the flaps blew up to a trail position. The aircraft commander proceeded to the jettison area to get rid of the external load. He allowed the airspeed to drop below 200 KCAS during the jettison attempt — only one outboard tank released. With airspeed this low, lateral control and then the aircraft were lost.

The Dash One states that the F-4 can be flown with asymmetrical loads of up to one full outboard drop tank, and it can — but not at low airspeed and high angle of attack. To date, incident reports indicate that one F-4 has been successfully recovered from a spin with one full drop. Another successful, but hairy, recovery was made in the traffic pattern. Airspeed and common sense will keep you out of this coffin corner.

ACM/ACT

Aircraft lost in ACM/ACT were obviously involved in maximum performance flying. It is of considerable interest to note that of 44 loss-of-control accidents, only six have been in the ACM/ACT phase. That is, these aircraft were engaged in air combat maneuvering in flights of two or more and were maneuvering against each other.

These accidents are examples of classic out-of-control conditions. The aircraft were being flown in the area of moderate buffet (max performance regime) and in some cases the effort to squeeze out that last one-half G put the F-4 over the brink during hard turns, low speed-high AOA maneuvering, or rudder reversals. When you are walking the tight rope in this situation anything but smooth, coordinated control inputs is going to put you in never-never land. The ease with which the F-4 can be flown into a stalled condition, compounded in some cases by the misapplication of recovery controls ultimately led to loss of control.

GROUND ATTACK

Losses during the ground attack maneuvering phase are beginning to look like a trend. Eight F-4s have been lost here including all the fighter models, the C, D, and E. Two aircraft were lost when they were inadvertently stalled during weapon delivery recoveries. All indications are that the pass started out badly and the aircraft commander elected to press on in hopes of salvaging it. In both cases, low altitude precluded recovery or crew escape.

Control was lost on two other aircraft during roll-in for rocket passes. Again, it appears the aircraft commanders set up poor patterns and in attempting to correct, flew themselves into a stalled

condition. From the normal roll-in altitude of about 7000 AGL, very little time is available for recovery or crew escape. Recovery at these altitudes depends on instant recognition of the problem and immediate corrective action.

Two F-4s were lost during roll-ins to simulated weapon delivery passes from pop-up maneuvers. In both cases, the aircraft were flying in the Nr 2 position. In one accident, the Nr 2 aircraft crossed from the left wing to the right wing, while the leader was in a slight right turn during the pop-up. The leader initiated a left roll-in followed by his wingman. The Nr 2 man was seen to rock, snap to the right, enter a spin and crash. Ejections were too late. The other accident in this category was similar except that the roll-in altitude and airspeed appeared slightly lower than desired.

One aircraft was lost when the aircraft commander stalled rolling in for a strafe run. He overshot the roll-in to final and didn't have his weapon control switches set up for the event. Preoccupation with the switches probably led to the overshoot which led to the stall. The remaining aircraft was lost after the F-4 flew approximately 500 feet to the left of the target. The AC initiated re-attack by pulling up to the right to about 5000 feet AGL and continuing a hard descending right turn toward the target. The aircraft stalled, snapped, and crashed near the target.

In almost every one of these accidents, the aircraft commander tried to salvage a pass after he'd made a mistake. The lesson is pretty straightforward — set it up right or break it off and try again. After all, it's only practice.



MANEUVERING FLIGHT

In maneuvering flight, a category that includes all the cats and dogs type accidents, we lost 10 F-4s. They look like this:

- Stalled in a hard turn during a sidewinder re-attack at low altitude.
- Lost control during intrail acrobatics.
- Stalled performing a split-S.
- Lost control during a simulated SAM break.
- Spun while maneuvering to avoid other aircraft.
- Lost control during an inverted flight maneuver.
- Spun out of a confidence maneuver during IP upgrading.
- Spun out doing a roll around the leader for spacing.
- Two aircraft spun out during high-AOA basic flight maneuvers.

JOIN-UPS

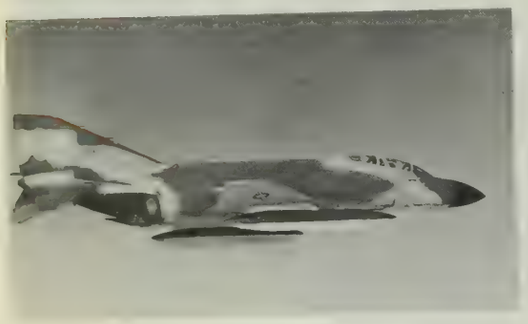
Four aircraft were lost during join-ups. One, the rear seater was flying and he used top rudder to kill his overtake speed. The F-4 snapped and he lost it. Due to the low altitude, only one crewmember escaped. Another loss occurred when a join-up attempt ended in a near head-on pass. The aircraft commander tried a high side yo-yo and spun out. The other two were lost due to excessive AOA during rolling join-up attempts.

NON-MANEUVERING FLIGHT

In this category one aircraft entered a spin after refueling when the aircraft commander overcorrected in pitch, induced a violent, longitudinal oscillation and subsequently lost control. Another aircraft was lost in the GCA pattern when the aircraft commander lowered the gear but elected not to lower flaps because he did not want the trim change during the base leg turn. He let airspeed decay until the F-4 stalled. The last F-4 bit the dirt when the aircraft commander could not control a nose rise, lost control and the crew ejected.

There you have the story — the

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big picture. Forty-four F-4s have gone to the melting pot due to loss of control. **A significant factor in these losses is that in these 44 bashes, the flight manual out-of-control procedure was not used once!**

Most of the aircraft commanders' actions during these accidents were to go first to the spin recovery control positions. If the F-4 was not in a steady state spin at that time, it was shortly thereafter. The misapplication of control drove the airplane into a steady state spin. Spin recoveries are possible from this condition, but experience has shown that for the average pilot the probability is low. Aircraft commanders in deep trouble used the drag chute only nine times in recovery attempts. Four of the chutes streamed due to late deployment, two were deployed too low for recovery, and three separated from the aircraft due to undetermined causes.

In all cases the drag chute was used as a last resort and not in the sequence established in the flight manual. The effectiveness of the drag chute is drastically reduced once a steady state spin develops. As the new flight manual states: USE THE OUT-OF-CONTROL PROCEDURE BEFORE USING THE SPIN PROCEDURES. Coming home minus the drag chute and facing the wrath of the Wing Commander is like nothing compared to the storm generated when you walk in from the smoking hole.

In 28 of the accidents, the sequence of events leading to the loss started below 10,000 AGL. This low altitude does limit recovery time, and it is also the flight manual eject altitude. Recoveries have been made below 10,000 but only because instant recognition of the problem and positive control applications by the AC saved the day.

In addition, a few incident reports are available to document the effectiveness of the flight manual out-of-control procedures. Bar talk, usually considered the fighter pilot's confessional, tends to confirm the effectiveness of these procedures when they are immediately and correctly applied.

Don't sit back and say it can't happen to you. Pilot experience in these accidents has varied from new heads with two hours in the F-4 to highly qualified drivers with over 1100 hours in the airplane.

One of the most often repeated statements from the out-of-control accidents is, "I knew I couldn't be stalled because I had 300 knots when I entered the maneuver." The F-4, like every other airplane, stalls at a given AOA. The AOA can be driven to the stall point very easily. Entry airspeed doesn't determine when the airplane will stall.

Most F-4 jocks swear by the airplane and say that it's the most stable, honest fighter they have ever flown. Fortunately, that is true for the majority of pilots. However, sad to say, there are still 44 reasons why some improved stall warning is needed.

Remember, the F-4 can safely be flown to its maximum performance by a knowledgeable, well-trained fighter pilot. If you are lucky enough to be herding an F-4 around the sky, make sure you know the operational limits of the airplane. A good place to start is the Dash One, Section Six. Read it and believe it. A number of films showing the F-4 doing its thing are available. Ask your friendly Safety Officer to show them periodically. There are many publications available on high AOA flying — dig them out and read them. If you don't understand, ask some questions.

Above all, whatever you do, don't become Number 45! ★



AT PRESSTIME, NUMBER 45 HAD OCCURRED. DON'T BECOME NUMBER 46!

Ed.

THE I.P.I.S. APPROACH

By the USAF Instrument Pilot Instructor School, (ATC) Randolph AFB, Texas

HOLDING PATTERNS

Q When do I hold in the published holding pattern?

A Always, unless specifically instructed otherwise. With the advent of published holding patterns on enroute charts, there is apparently some confusion about when to use them. In an attempt to clarify holding, the following is a review of correct procedures.

Let's first consider procedures to be used with normal air to ground communications. Prior to arriving at your clearance limit fix (destination or enroute) the controller should give you holding instructions if a delay is anticipated. If the holding pattern is not published, the controller will issue "cleared to (fix), hold (direction)." If the holding pattern is not published, the controller will issue general holding instructions or, upon the pilot's request, detailed holding instructions. General instructions contain: (1) direction of holding from the fix; (2) holding fix; (3) radial, course, bearing, etc., on which to hold; (4) outbound leg length if DME is to be used; and (5) direction of turns if left turns are required. Detailed holding contains the same items except that the outbound leg must be given in either miles or minutes and direction of turn must be given.

Now, still assuming communications are normal, what happens if the controller does not give holding instructions? The answer is quite simple: If there is a holding pattern published, enter it!! This does not include missed approach holding patterns. If there is more than one holding pattern published (it's possible), take your choice. If there is no holding pattern published, you should hold in a standard pattern on the course by which you approached the fix. THESE PROCEDURES APPLY TO BOTH ENROUTE AND DESTINATION CLEARANCE LIMIT FIXES.

The next point of confusion seems to be, "what about holding procedures with inoperative communications?" The answer again is quite simple — no change. DOD FLIP Enroute, IFR Supplement still states that the published holding pattern will be used. If none is published, hold on the side of the final approach course to the fix on which the procedure turn is prescribed. At this point, a cry of anguish can usually be heard. "What if there is neither a holding pattern nor procedure turn published?" Or, "What if I'm using a JAL procedure where there are no procedure turns shown and there's no published holding pattern?" At this point the pilot will have to use his best judgment. A procedural change has been suggested which reads as follows: "Hold in a standard pattern at the initial approach fix on any course convenient to the subsequent accomplishment of the approach." We think it's a good method.

SID

Q When I list a SID on the DD-175, what do I put in the "TO" block?

A If the published SID terminates at a fix other than one in the route structure you intend to fly, you should put that fix in the TO block and the first entry in the route of flight would be to an enroute facility. If the SID has a published transition to an enroute facility, you may list the enroute facility in the TO block. The pilot should bear in mind that the filed route of flight, including the SID, should provide a complete route of flight for use in the event of communications failure.

ATTENTION, HELICOPTER PILOTS!!

The IPIS hopes to eventually expand to include an Instrument Instructor Course for helicopter jocks. We now have a fully qualified helicopter pilot assigned, so you have a direct point of contact in the IPIS. We hope your response to this will be cards and letters with helicopter instrument-related questions.

CHECK THE MARCH IPIS

Two corrections:

- Touchdown zone elevation is the highest elevation in the first 3000 feet of the runway. (Not 300!)
- Civil precision radar approach controllers are not required to inform USAF and USN aircraft when they reach decision height as military GCA operators are. ★

understanding AND using ground effect

Capt Bert A. Smith, American Airlines

Vol 26, No 5

Because of the relatively long period of time that they spend in ground effect, large aircraft lend themselves to a technique of utilizing this effect to cushion the touchdown. Unfortunately, the aerodynamic phenomenon of ground effect is generally misunderstood. What follows is not intended as a definitive explanation of all the causes and results of ground effect, but it should clear up some of the misconceptions.

In order to understand the changes that take place when an airplane flies in proximity to the ground, a review of the development of lift by a wing is in order. Nothing need be said here as to why a wing creates a pressure differential between its upper and lower surfaces, and that the results of this difference is lift. However, another result of this pressure difference is the wingtip vortex. It is this vortex that must be examined in order to understand ground effect.

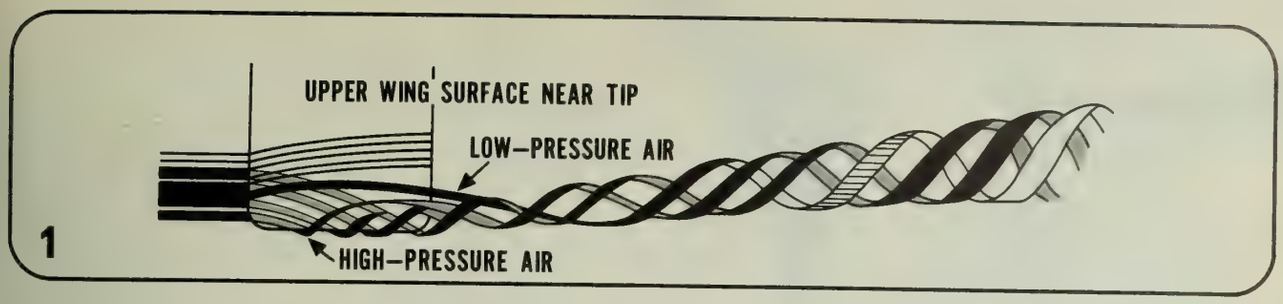
Tip vortex develops because the higher pressure under the wing tries to flow toward the lower pressure on the upper surface, the path of least resistance being via the wingtip. This flow, when coupled with the remote free stream, produces the vortex. This much is obvious. What is not obvious, however, is the profound effect that this phenomenon has on the development of lift by a wing.

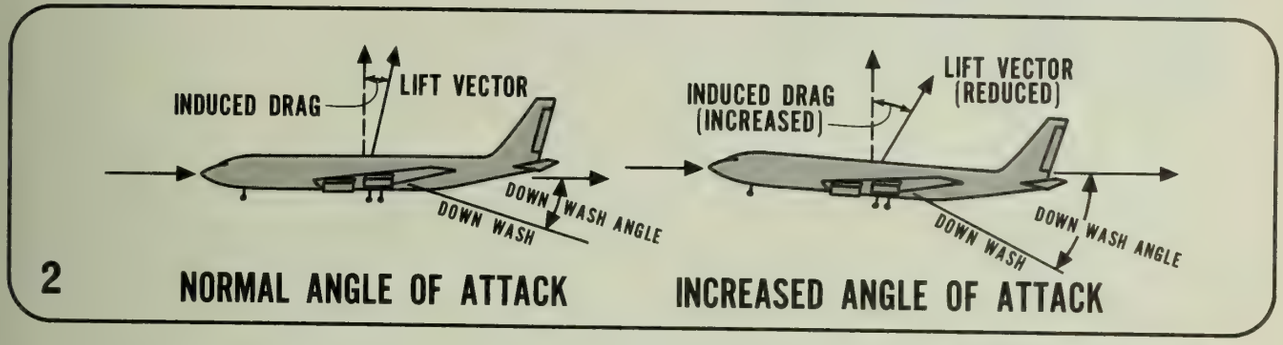
Simply stated, the tip vortex, when coupled with what is called the bound vortex, (the flow from the leading edge to the trailing edge over the curved upper surface) induces a downwash aft of the wing. The net result is that the relative wind in the vicinity of the wing is angled slightly downward. Since lift is perpendicular to the relative wind, a component of lift is always angled aft. This aft inclination of the lift vector will produce a certain amount of drag. This type of drag is called induced drag. The greater the angle of attack the wing is operating at, i.e., the slower the speed, the more the induced drag.

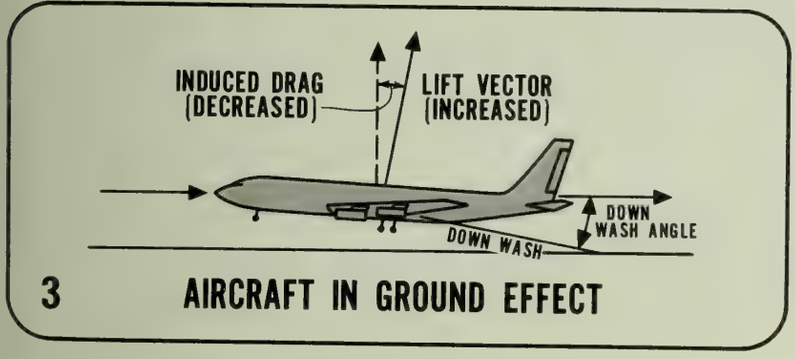
As the airplane nears the ground during the landing approach, the tip vortices begin to shrink, since the ground will not allow vertical components of flow. As the tip vortices shrink, the induced downwash angle lessens, the induced angle of attack decreases, and therefore, the induced drag becomes less. The net effect is an increase in lift.

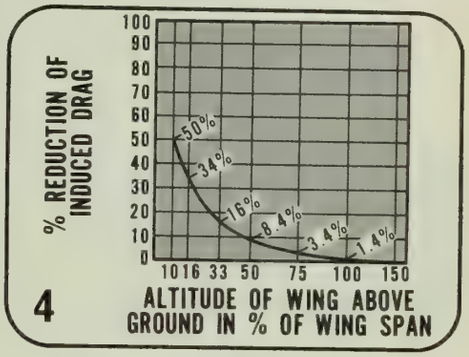
The wing may be said to be operating in ground effect when the height of the wing above the ground equals its span. The reduction in drag at that height is, however, quite small, about one and one-half per cent. When the altitude reaches a height equal to one-fourth the span, however, the reduction in induced drag is on the order of 24 per cent. At one-tenth span height, the reduction reaches about 48 per cent.

Another result of coming into proximity to the ground is a nose down pitching moment. This is due to the decrease in downwash over the horizontal stabilizer, since again, the ground prevents vertical components of flow. Because of the high position of the horizontal stabilizer, T tail aircraft show less of this effect.









The results of the above phenomena are experienced by the pilot in a classical ground effect situation as first, a mild pitch-down as the airplane nears the runway, and then, if the descent rate is not excessive, a cushioning that produces a gentle touchdown. The airplane will undergo ground effect during every landing. However, whether or not the increase in lift is enough to cushion the landing depends on the airspeed-descent rate combination. Ideally, the airplane should be in a steady-state condition during the approach, so that as the threshold is reached, no thrust, airspeed, or descent rate excesses or deficiencies are present. The pilot then need only make what is usually a slight adjustment in the flight-path angle to insure that the descent rate is not excessive for the airspeed being flown, and the increase in lift from ground effect will cushion the touchdown.

Utilizing the ground effect for landing is easiest when still air conditions for the approach and touchdown are present. The airplane can be controlled more precisely, and the lack of gusts makes its response from the threshold to landing more predictable. Gusts just before touchdown can upset the balance of forces acting on the airplane. An increase in wind increases the airspeed, which intensifies the ground effect. This will slow or stop the descent-rate prematurely, and usually leaves the airplane a bit high. A decrease in wind decreases the airspeed. Some lift is momentarily lost, and the descent rate tends to increase. Obviously, unless immediate corrective action is taken, a "firm" landing will ensue. Ground effect can be utilized in gusty cases, but the pilot must exercise tight control over the airplane, and be alert to correct airspeed and descent rate excursions as they occur. ★

(Reprinted from
Air Canada *Grapevine*)

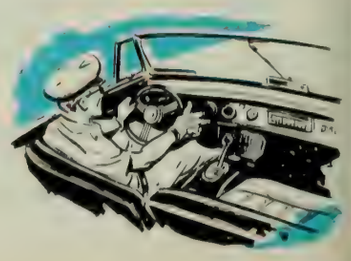


habit pattern transference

Lt Col R. D. Hansen, 58 Tac Ftr Tng Wg, Luke AFB, Arizona

Habit pattern transference is, I think, what killed an IP in a fighter accident last year. It is the person highly experienced in one mode of behavior who is most likely to be the victim of this phenomenon. The person who does not have firmly established habits doesn't have the problem. Habit pattern transference is defined as "inappropriate patterns of automatic behavior." This is pretty fancy terminology so let me give you some examples to illustrate what it is.

For those of you who have at least two family cars, one with power brakes and the other having standard push-hard brakes, if you have been used to driving the automobile with power brakes, then go back to the other one, you find that the brakes do not work very well because you are just tapping them with your toe. This will be even more noticeable when you go from the old car to the power brakes and throw everybody into the windshield because you are really shoving the brakes down and you don't need to. This is "inappropriate behavior."



Let's suppose that one of your cars has a floor shift and the other has a steering column shift. I happen to have this problem. The car I drive to work has a floor shift and the one I leave with my wife has the other type on the steering column. If I switch cars for some reason I find myself reaching down on the floor to shift the gears, when the gear shift is up on the steering column. This is "habit pattern interference."

We had an interesting example recently in the Wing Staff meeting. The Wing Commander was unavoidably delayed. At the time he normally arrived, another officer walked in and, everyone being primed to leap to their feet, we all stood up. This made the officer feel great, but the rest of us felt like clowns. This is "habit pattern interference."

How do we get habit pattern interference? First, you have to have a habit. The more ingrained the habit, the more likely you are to carry it over into some situation where it is not appropriate. Take the case of the well-trained pilot who learned always to hook up the gold key. Then he began using a different parachute that does not utilize the gold key but rather a cable the pilot plugs in. This is the problem we're talking about. The person has this habit. The more similar the situation, the more likely you are to transfer one habit to another. Now, if you usually drive your car to work but occasionally ride a bicycle to work, you are not likely to look for the gear shift lever on your bicycle, so you do not transfer under these circumstances because the situations are not similar enough.

One of the commonest examples you see is when someone catches his hand on something sharp or, say, a dog bites your hand. The sensible thing to do is to leave your hand in the dog's mouth, open his mouth and take your hand out. But the normal reaction is to jerk your hand back, and what do you do? Instead of getting a little puncture wound, you get a nice big gash in your hand. The habit is to pull back quickly when something bites you.

So, these are the two things to remember: The more ingrained the habit and the more similar the situation, the bigger problem habit transference is likely to be.

Distraction is another factor. I can certainly see where an IP could be distracted on a transition ride with a student because he is trying to watch what the student is doing. If the student does something inappropriate or the IP is afraid that he will at the time when the IP is hooking up, there is a good chance that he will hook up improperly.

Then there is fatigue. It will make you fall back on automatic behavior. The more tired you get, the less thinking you do, and the more you function automatically.

How can you prevent habit transference from biting you? One thing the Air Force encourages is the use of checklists. Now this is fine for slow, timed procedures, but you cannot ordinarily pull out



a checklist when you have an emergency ejection, so you must fall back on your automatic habits and, hopefully, you will have the right habit which you got through repeated training. This is why you go through egress procedures on the ground periodically — you are trying to develop a set of automatic habits so that you can get out without having to think, "What do I do next?"

If you switch procedures you have to unlearn what you previously learned and learn something new. Therefore, what you need to remember—and the whole point of this article—whenever you switch procedures where something you have learned to do automatically is inappropriate, be aware that habit pattern transference is a potential problem.

Think yourself through the new procedure and learn it better than you knew the last one, so that when the chips are down, and you have to perform automatically, you will perform in the proper way, *automatically*, and not go back to some old procedure which is no longer appropriate. ★

emergency EXIT ...THROUGH UPPER ESCAPE HATCHES B-52

Investigation following a B-52 landing accident revealed that the upper deck crewmembers experienced considerable difficulty in opening and lifting their respective escape hatches. It was further revealed that they did not follow the UPPER DECK CREWMEMBERS EMERGENCY EXIT INSTRUCTIONS provided in the emergency procedures section of the applicable flight manual.

A crewmember wouldn't think of making a flight without first mentally rehearsing each of the steps necessary for successful inflight ejection of his seat. But how much time is devoted to mentally rehearsing each of the steps necessary for a successful ground emergency exit? We all like to think that such emergencies only happen to the other fellow, but experience has proved that no one is totally immune. The best insurance is always to be prepared.

For those who have never opened and lifted an upper deck escape hatch, the following questions and answers, (and illustrations) should be of interest:

Q How far downward must the manual release handle be rotated to release the locking cam?

A Approximately 80 degrees.

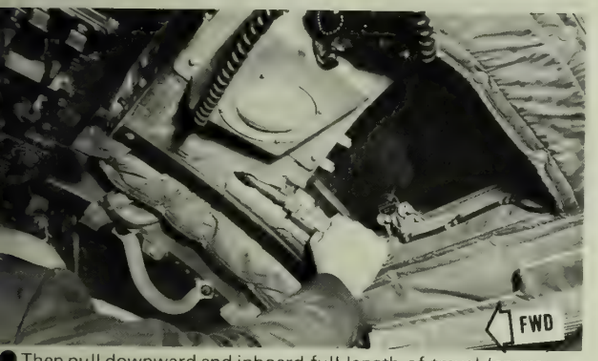
Q Once the locking cam releases, is there danger of it locking again when you turn loose of the handle to push upward on the hatch?

A No. The hatch will settle when you let go of the handle, but once released, it can't lock again of its own accord.

Q On which side or end does the hatch pivot and to what area of the hatch should a manual upward force be applied for best efficiency?



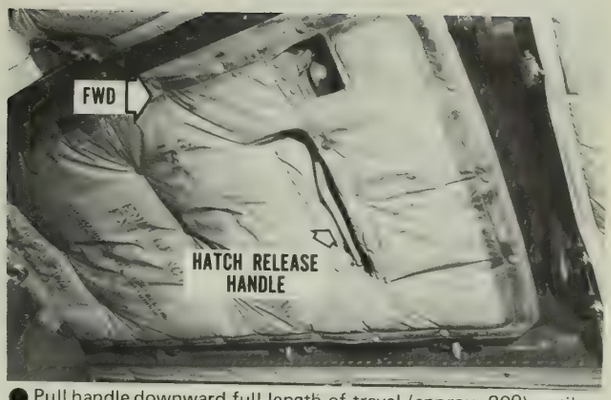
● On B-52C – F airplanes, rotate handle forward out of stowage clips (approx. 90°).



● Then pull downward and inboard full length of travel (approx. 80°) until locking cams release.

● Apply manual upward force on forward edge of hatch, rotating hatch upward and aft (approx. 95°) until it falls free of the airplane.

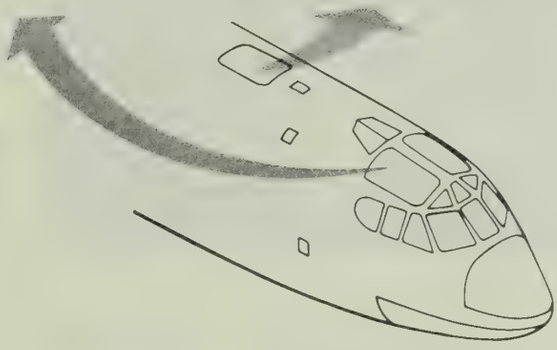
COPILOT'S HATCH (PILOT'S HATCH TYPICAL)



● Pull handle downward full length of travel (approx. 80°) until locking cams release.

● Apply manual upward force on forward edge of hatch, rotating hatch upward and aft (approx. 95°) until it falls free of the airplane.

EW OFFICERS HATCH



B-52C–F

A The hatch is hinged on the aft end and manual upward orce must be applied on the forvard end. The hatch weight, and he possibility of it sticking to the eal can make it nearly impossible or a man to apply enough force in ny other area to lift the hatch.

Q What is the approximate weight of the hatch?

A Approximately 150 pounds. This requires a minimum of 5 pounds upward force at the orward edge.

Q How far must the hatch be rotated before it will fall free of the aircraft?

A Approximately 95 degrees.

Q When a ground emergency or crash landing makes manual removal of the hatch necessary, what is the correct procedure to follow?

A Refer to the emergency section of the applicable flight manual. Presently, the emergency exit procedure for upper deck crewmembers (P-CP-EW-G) is as follows:

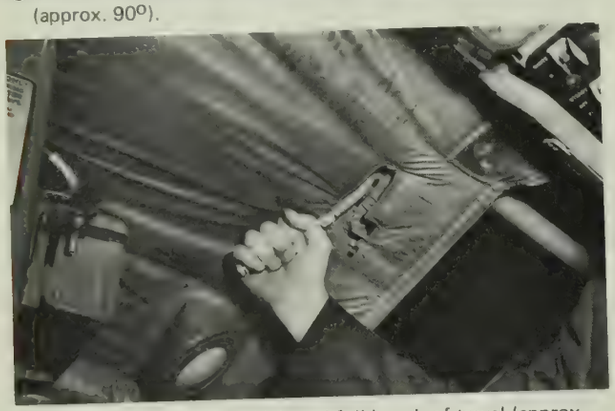
UPPER DECK CREWMEMBERS (P-CP-EW-G)

1. Install armrest pins.
2. Unfasten safety belt.
3. Disconnect oxygen and interphone.
4. Remove parachute and survival kit by unfastening parachute leg and chest straps.
5. Stow control column (P-CP).
6. Stand facing aft.
7. Pull hatch release handle down and rotate full length of travel (approximately 80 degrees.)
8. Release hatch release handle.

CONTINUED ON NEXT PAGE



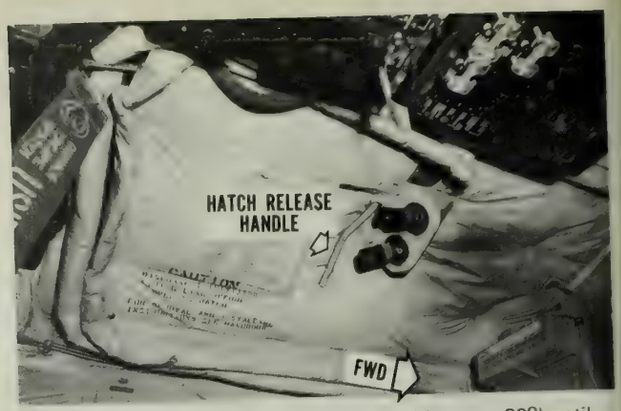
● On B-52G – H airplanes, rotate handle aft out of stowage clip (approx. 90°).



● Then pull downward and inboard full length of travel (approx. 80°) until locking cams release.

● Apply manual upward force on forward edge of hatch, rotating hatch upward and aft (approx. 95°) until it falls free of the airplane.

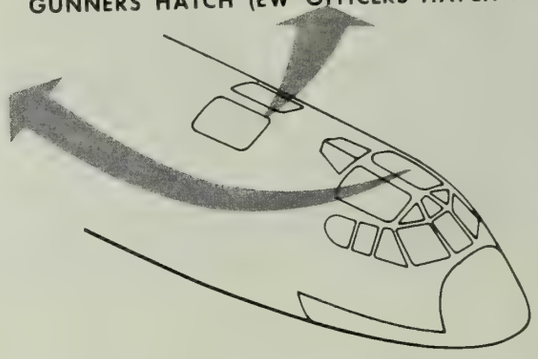
PILOT'S HATCH (COPILOT'S HATCH TYPICAL)



● Pull handle downward full length of travel (approx. 80°) until locking cams release.

● Apply manual upward force on forward edge of hatch, rotating hatch upward and aft (approx. 95°) until it falls free of the airplane.

GUNNERS HATCH (EW OFFICERS HATCH TYPICAL)



B-52G–H

EMERGENCY EXIT CONTINUED

NOTE

It is not necessary to hold the hatch release handle when removing the hatch. Although the hatch settles somewhat when the handle is released (because of hatch weight), the locking cam will not travel back past overcenter.

9. Push hatch upward and aft, stepping into seat while doing so. Continue pushing until hatch has rotated approximately 95 degrees and falls free of aircraft.

NOTE

As the hatch is rotated, the mechanical link connecting the hatch to the catapult safety pin-pull initiator will fire the initiator. Do not be alarmed; although the seat catapult is armed, it will not fire unless the firing trigger on the armrest is squeezed.

One B-52 base assures that its flight crewmembers are knowledgeable about upper deck escape hatch removals in the following manner: When maintenance requires removal of an escape hatch from a B-52, the flight crewmembers of that airplane are requested to make the removal.

The important thing is to know your emergency procedures so well that when the situation arises you can think clearly, act precisely, and exit quickly.

(Boeing Service News)



DURING a B-52 accident gunner scrambled out of th section and found himself hanged by his oxygen equip Fortunately he was able to su himself by his escape rope he pulled the oxygen hose enough to break it and the cord inside.



CAMERAS

Talk about stacking the odds against yourself! Or deliberately distorting the world outside your cockpit — but let's start at the beginning.

A Solo UPT student, returning from the practice area, buzzes his way down a river and winds up as part of a black smoking hole in the ground. Unhappily, it's an old story. But there's an unusual twist to this one that made me sit up and pay attention.

In this accident a strong possibility exists that the student was trying to take photographs while he was buzzing his way to that smoking hole. A hunter nearby saw the airplane at high speed about 50 feet above the river shortly before the crash. And the accident investigators found enough evidence in the wreckage to make it look like unauthorized, foolhardy and amateurish low-level photo recon.

Just imagine his distorted view of the terrain ahead, looking through a rangefinder! There's plenty to keep one pilot busy in the cockpit even if he doesn't violate the rules, flying at dangerously low altitude. Taking pictures from many times this pilot's height above the ground is tricky (you don't often get good pictures). And you tend to let aircraft control become secondary, violating a very basic rule.

I don't recommend the photography bit unless you have someone else along to handle the airplane while you do your thing with the camera. ★



REX RILEY
Transient Services Awar

LORING AFB	Limestone, Me.
McCLELLAN AFB	Sacramento, Calif.
MAXWELL AFB	Montgomery, Ala.
HAMILTON AFB	Ignacio, Calif.
CHANUTE AFB	Rantoul, Ill.
SCOTT AFB	Belleville, Ill.
RAMEY AFB	Puerto Rico
McCHORD AFB	Tacoma, Wash.
MYRTLE BEACH AFB	Myrtle Beach, S.C.
EGLIN AFB	Valparaiso, Fla.
FORBES AFB	Topeka, Kans.
MATHER AFB	Sacramento, Calif.
LAJES FIELD	Azores
SHEPPARD AFB	Wichita Falls, Tex.
MARCH AFB	Riverside, Calif.
GRISSOM AFB	Peru, Ind.
PERRIN AFB	Sherman, Tex.
CANNON AFB	Clovis, N.M.
HICKAM AFB	Hawaii
LUKE AFB	Phoenix, Ariz.
RANDOLPH AFB	San Antonio, Tex.
ROBINS AFB	Warner Robins, Ga.
TINKER AFB	Oklahoma City, Okla.
WETHERSFIELD AB	England
HILL AFB	Ogden, Utah
YOKOTA AB	Japan
SEYMOUR JOHNSON AFB	Goldsboro, N.C.
ENGLAND AFB	Alexandria, La.
MISAWA AB	Japan
KADENA AB	Okinawa
ELMENDORF AFB	Alaska
PETERSON FIELD	Colorado Springs, Colo.
RAMSTEIN AB	Germany
SHAW AFB	Sumter, S.C.
WRIGHT-PATTERSON AFB	Dayton, Ohio
LITTLE ROCK AFB	Jacksonville, Ark.
TORREJON AB	Spain
TYNDALL AFB	Panama City, Fla.
OFFUTT AFB	Omaha, Nebr.
ITAZUKE AB	Japan
ANDREWS AFB	Washington, D.C.
McCONNELL AFB	Wichita, Kans.
NORTON AFB	San Bernardino, Calif.
BARKSDALE AFB	Shreveport, La.
HOMESTEAD AFB	Homestead, Fla.

AIRPLANES

There's an old saying that "A squeaking wheel gets the grease." That explains why articles on FOD appear so frequently in safety publications. Ruined engines, blown tires, and jammed controls keep "squeaking" for more preventive "grease."

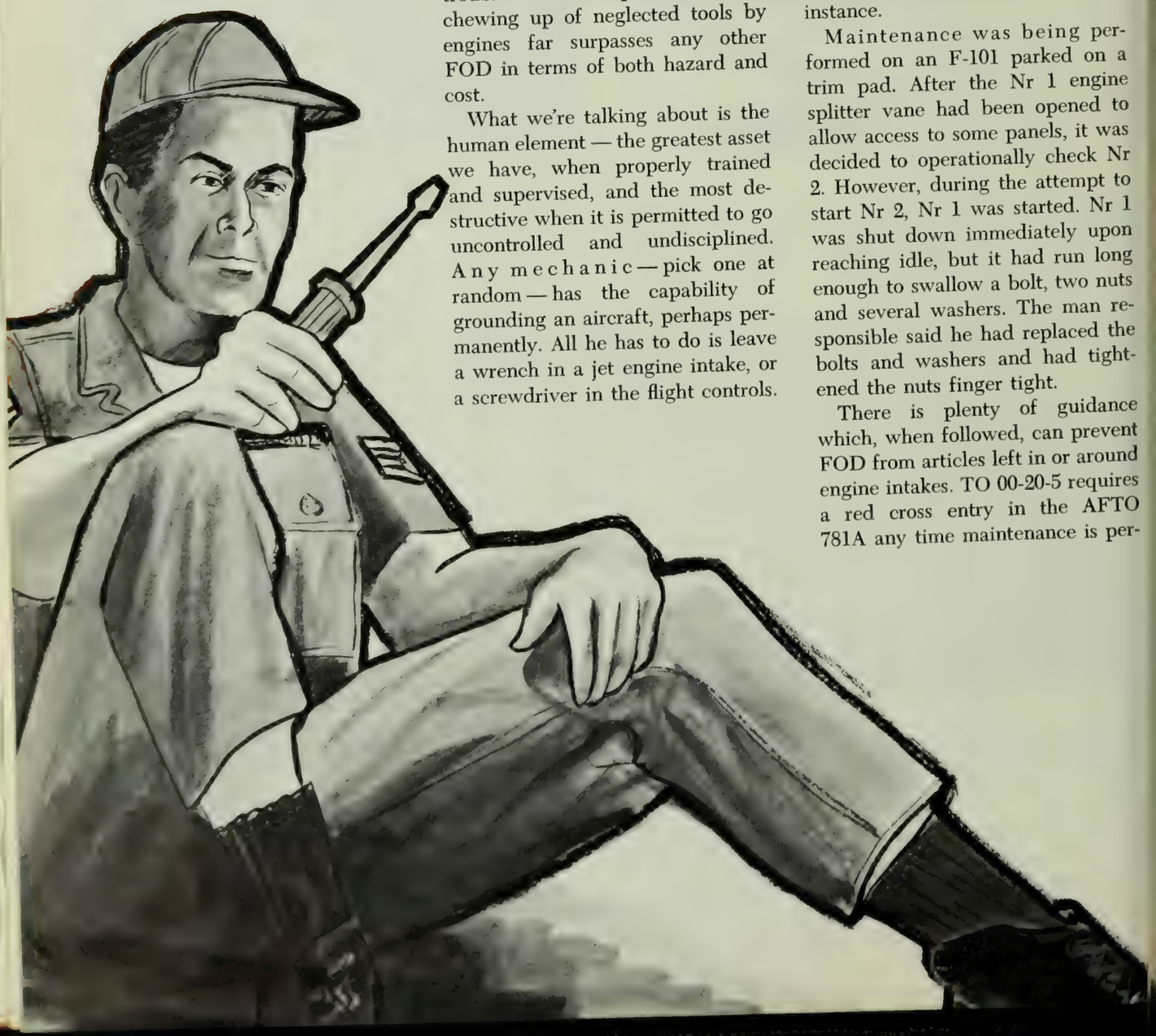
While foreign object damage covers quite a gamut, this article will address specifically the subject of tool control because that is probably our biggest controllable FOD problem. Dirt in hydraulic systems, objects on the runway that cause tires to blow out, are troublesome and expensive, but the chewing up of neglected tools by engines far surpasses any other FOD in terms of both hazard and cost.

What we're talking about is the human element — the greatest asset we have, when properly trained and supervised, and the most destructive when it is permitted to go uncontrolled and undisciplined. Any mechanic — pick one at random — has the capability of grounding an aircraft, perhaps permanently. All he has to do is leave a wrench in a jet engine intake, or a screwdriver in the flight controls. This doesn't take talent or smarts. It does take carelessness, poor planning or an I-don't-care attitude. These are qualities that the Air Force can do without.

If what has been said seems a bit tough, consider the fact that FOD costs us (you and me and every other American) millions of dollars a year, not to mention the loss of mission capability. Here's a for-instance.

Maintenance was being performed on an F-101 parked on a trim pad. After the Nr 1 engine splitter vane had been opened to allow access to some panels, it was decided to operationally check Nr 2. However, during the attempt to start Nr 2, Nr 1 was started. Nr 1 was shut down immediately upon reaching idle, but it had run long enough to swallow a bolt, two nuts and several washers. The man responsible said he had replaced the bolts and washers and had tightened the nuts finger tight.

There is plenty of guidance which, when followed, can prevent FOD from articles left in or around engine intakes. TO 00-20-5 requires a red cross entry in the AFTO 781A any time maintenance is per-



OR BICYCLES

formed in or around the intake. In addition, most units require a red cross for intake inspection at the completion of each flight and before each ground operation of an engine.

If the red cross is properly cleared there should not be any FOD, at least not of the type caused by tools and equipment left in or near the intake. To properly clear the red cross, the inspector must assure himself, beyond a shadow of a doubt, that the intake and surrounding area is free of any foreign objects. He cannot afford to take another man's word for it, regardless of what other tasks may demand his attention. He should be fully aware of the consequences if he signs off an intake as clear when it wasn't and subsequent FOD ruins the engine.

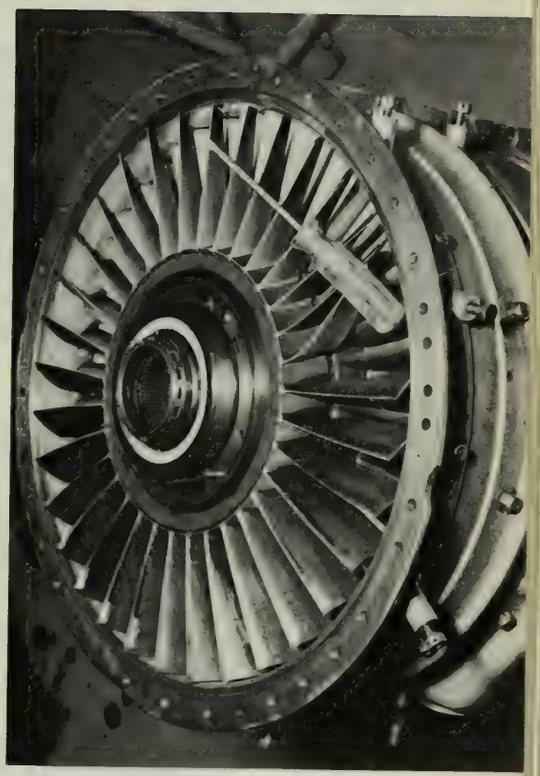
Many systems have been devised to beat the FOD problem by helping the mechanic control his tools. Check an article titled "Guys and Dollars" in the October 1960 issue of *Aerospace Maintenance Safety* - the safety office may have a copy. The article advocated use of an inventory card bolted inside tool boxes. Also in the same magazine, October 1968, was an item on a dial indicator mounted inside the box. A number of different check-off systems have been devised, along with tool counts, tool numbering, etc. But no matter how good the system, we keep getting back to the man who operates it. The responsibility is his and he can't escape it any more than the inspector can who signs off without a thorough inspection.

Suggestions have been made that when FOD can be proven to have been caused by negligence that the responsible persons be charged for the damage. From the education standpoint we do think that every person in a position to create FOD should have an appreciation of the cost of his actions.

Money — the cost of repair or replacement — is one thing. But how about the possible cost in lives. How would you feel if you knew that it was your screwdriver that jammed the controls of a fighter and that the pilot lost his life when the bird crashed? Here's an example in which the pilot landed safely, but others haven't been so lucky.

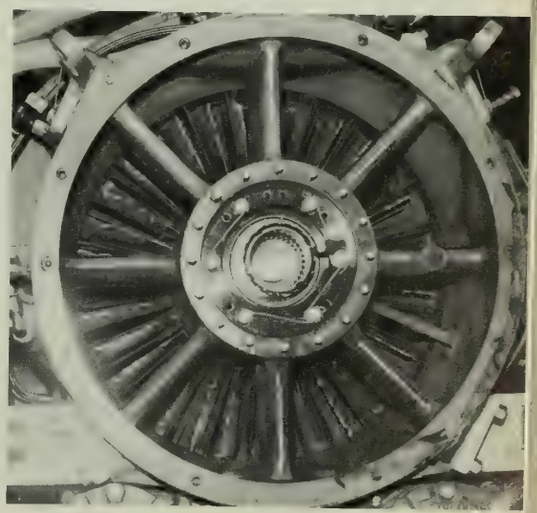
During descent the pilot of an RF-84F discovered that only a fraction of right stick movement was available. He "pounded" the stick until he got approximately 20 per cent of aileron control from neutral. After declaring an emergency he landed. A six-inch screwdriver was found wedged in the aileron control stop area. No one has claimed the screwdriver.

Remember when you were a kid? You were probably a built-in FOD problem, although not of the consequence of the one you have on the flight line. All small boys love to work with dad's tools. This is a healthy thing, but you know how difficult it is to teach junior to put each and every tool back in its place. Men are supposed to be more responsible than small boys. And their jobs reflect this; small boys don't work on multi-million dollar airplanes. But sometimes men who do act like small boys when they leave tools lying around. Better they should be working on bicycles. ★



Who will lay claim to this screwdriver?

Would you like to pay the cost of repairing this engine?



Maj Edwin L. Marsh, Directorate of Aerospace Safety

T-39 what drains?



Two drains under pitot tube on either side of fuselage.

During climbout the T-39 pilot's airspeed indicator read 30 knots lower, and the altimeter 2000 feet lower, than the copilot's instruments. The alternate static system was selected and readings appeared normal. However, during the landing approach, with a chase plane, the pilot's airspeed still read low. A successful landing was made at the nearest VFR base.

Maintenance personnel discovered that both the pilot's and copilot's static lines were ruptured because the two pitot static system drains located in the nose wheel well were not drained during preflight. When the aircraft was flown above the freezing level, the trapped water in the lines froze and ruptured both static lines.

The crew chief had properly opened the two drains on each side of the fuselage just below the pitot head, but he was not aware of the two drains in the nosewheel well. These two drain plugs, along with the identification placards, were painted over, making them difficult to locate.

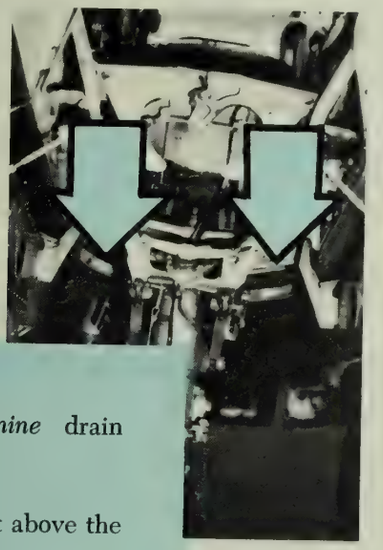
Maintenance personnel responsible for draining moisture from T-39 pitot static systems should be aware of all nine drain locations. Since no common low point exists, the entire system should be drained during each postflight, preflight, phase inspection, and any other time deemed necessary such as after heavy rains or aircraft washing. SMAMA is presently revising the Dash Six and all preflight, postflight, and phase inspection work cards to insure that draining is accomplished properly.

Note for Pilots: Since on occasion you may have to perform your own preflight, the following data are extracted for your use from TO 1T-39A-2-1:

"To drain pitot-static system re



drains located one on side of nose wheel well.



ove the following *nine* drain ugs:

• One plug in cockpit above the lot's left rudder pedal.

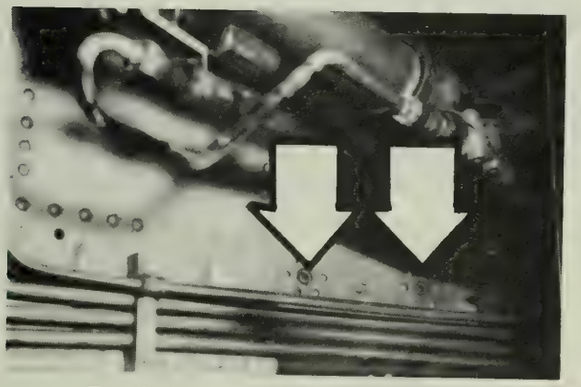
• Two plugs on each side of the selage just below the pitot head.

• Two plugs in the speed brake ell, right hand fuselage station 5 (On T-39A 59-2871 and later planes).

• Two plugs in the nose wheel ell, one on each side of the aft d." ★



One drain located left of pilot's left rudder pedal.



Two drains located in speed brake area.

experts talk about th

R. D. Becker, SAAMA
Kelly AFB, Texas

CARBURETOR: "A sensitive device designed and calibrated to produce proper fuel/air ratio regardless of changes in RPM, altitude or temperature."

People who have had to change several carburetors have a different definition which would require several beeps if expressed in public. The prime objective of SAAMA, as far as carburetors are concerned, is to provide the best specifications and parts available to assure a quality product. Excluding some errors, which seem to occur regardless of repeated inspections, present carburetors should be good for four to five thousand hours of operation.

All carburetors now contain new style diaphragms that are less susceptible to rupturing. These new diaphragms are more flexible and temperature changes do not affect metering. R-2800 engine carburetors have had metal idle link bushings replaced by delrin bushings, eliminating the wave washer and two of the plain washers. Besides being easy to install, the delrin bushing has good wear characteristics and does not require lubrication. The only objection to this bushing is that it will bind if the nut on the through bolt is overtorqued. The nut must be screwed on by hand until it contacts the plain washer and then tightened one or two castellations to align the cotter pin hole. Mechanics can look for the delrin bushings to be installed in other carburetors on a phase-in basis.

Not long ago, Bendix and SAAMA engineers were asked to find out what type of grease and sealant would be best for use during carburetor overhaul. As a result, greases and sealants have been selected which will outlast the expected life of any carburetor.

From an operational standpoint, production of a serviceable carburetor determines 50 per cent of the metering performance to be realized on an installed engine. There are five major operations which must be accomplished correctly to achieve the remaining 50 per cent.

INSTALLING—When installing a carburetor be sure the hold down bolts/nuts are torqued to the values and in the sequence specified in the tech orders. This is extremely important, for although the body may appear to be a rigid piece of metal, it is not. There are several internal passages and in certain areas the walls are rather thin.

If the body is tightened at one end, the carburetor-to-case gasket will be compressed enough to raise the other end of the body. When the raised end is then tightened, the body will warp. Fuel flow variation of several hundred pounds can result. This has been verified by applying torque while observing fuel flow on carburetor test stands. A good rule to remember: always stagger-torque, starting in the center of the body and working outward.

BLEEDING — Even though carburetors employ dual vapor eliminators, all the air may not be expelled, especially during initial installation. The fuel chambers are filled with air before fuel under pressure enters them. Sometimes all the air will be forced out; when it isn't, trouble starts. Usually trapped air can be detected by fuel pressure fluctuation, but not in all cases. So bleed carburetors in accordance with the tech order.

IDLE ADJUSTMENT — Many publications and scholars of the old school believe the idle adjustment is effective only in the idle range and has no effect on carburetor operation at higher power settings. This is untrue, especially on larger engines. The R-4360 engine, for instance, has the idle valve modified to minimize idle effect at takeoff. On most engines the idle valve will remain in effect up to 2100-2200 rpm. Even though the size of the idle valve opening at speeds above idle RPM may be greater than the area of the jets, it will alter the pressure drop across the jets sufficiently to alter fuel flow. Tech order specifications for carburetor adjustment take these factors into account. Follow the book!

BOOST PUMP PRESSURE — High surge pressure resulting from rapid application of high boost has caused more carburetor internal failures than anything else. Years ago, the vapor eliminator floats were made of a rather thick stainless steel material. Unbelievably high surge pressure could collapse these floats. This same pressure

e round engines

CARBURETORS

also warped the stainless steel support plates for large diaphragms, causing regulators to malfunction. Tests have shown that pressures up to 125 pounds can occur when high boost is applied rapidly. Plastic floats have replaced the metal ones and diaphragm support plates have been reinforced, but the poppet valve diaphragm cannot be beefed up to withstand these high surge pressures.

Flight crews and maintenance men must always switch to low boost and allow pressure to stabilize before going to high boost. If this simple procedure is followed there will be no damage to the carburetor.

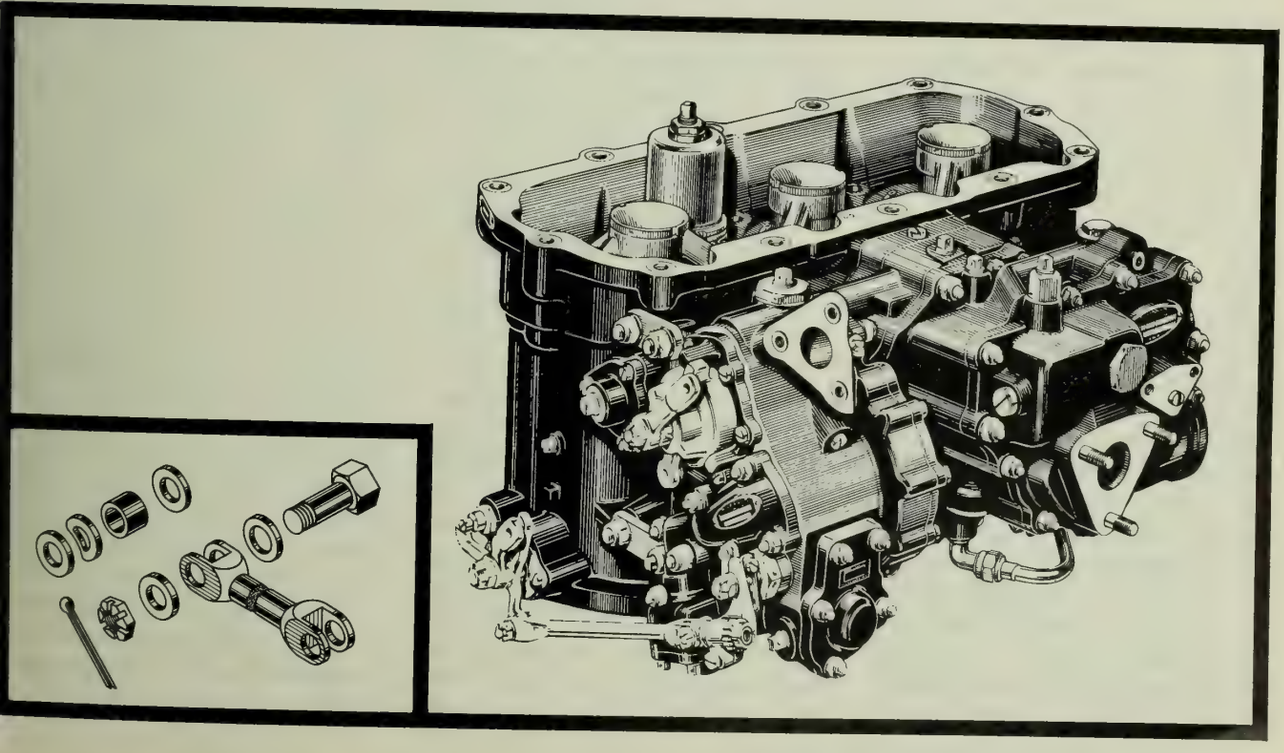
RAPID ACCELERATION — There are three types of acceleration pumps used on carburetors: One which charges and discharges with pressure changes below the throttle valve, one with a piston which discharges in proportion to throttle opening and rate of throttle movement, and one which discharges to a diaphragm causing the poppet valve to open. This last type is used in the R-2800 engine and all the pump pressure is exerted against a diaphragm having an exposure of one and three-eighths inches in diameter.

Years ago the material in this diaphragm was changed to reduce rupturing and the results have been excellent. But several EUR exhibits indicate that users are rupturing these diaphragms by rapid acceleration. During acceleration checks, the throttle should be advanced smoothly and evenly up to power check.

Carburetors are delicate instruments and must be treated as such. Treat them right and they won't let you down.

This concludes this series of articles on reciprocating engines and accessories. Our thanks to the various authors, all specialists at SAAMA. — Ed. ★

The metal wave washer and bushing have been replaced with a delrin bushing, making installation a lot simpler.





This improperly latched panel would come off in flight.



Loose airlocks are not always this easy to detect.

PANEL PROBLEMS

Anything that falls out of or off an aircraft in flight could mean that someone may be seriously hurt or killed, or that property could be damaged or destroyed. It could also mean that SOME MAINTENANCE MAN DIDN'T DO HIS JOB CORRECTLY.

The ball must have been pretty slippery last year because we dropped it at least 107 times. That's the number of panels reported lost in flight, and there may have been more. These ranged from gun bay doors to escape hatches and the reports read so much alike that they get monotonous: ". . . panel missing after flight. . . improperly installed."

There are a lot of reasons why a panel can be installed improperly (read not fastened, if you wish), but we've never heard of a good one. A common excuse goes something like this: The hydraulic shop repaired the flight control system and entered a red dash in the 781 for an operational and leak check. In the process a couple of panels on the vertical stabilizer were left unfastened because Transient Maintenance had to make a runup check. The hydraulic specialist and the TA chief verbally agreed that after the check TA would inspect the work area and fasten the panels.

You can guess what happened. The fasteners dropped down until they were flush with the surface, and the pilot and transient maintenance tech failed to catch the loose panel during the walkaround inspection. When the aircraft arrived at its first stop, one panel was missing and the other was hanging loose, out of position.

This was the result of poor communications. Maybe you've been bugged to death by that word, but that's the way it was: The 781 did not indicate that the panels were loose; the TA chief did not pass the word to his relief; the panels didn't get fastened.

One of the problems with panels is that they get bent or warped from wear and the fasteners become so badly worn they either won't fasten securely or they vibrate loose in flight. And of course there is the human factor in that sometimes someone is in a rush or careless and just doesn't get the fasteners properly secured. Some times a fastener is too tight and won't completely lock. This happens with overcenter cam locks and a little vibration causes them to let go.

There is really not much excuse for panels and doors falling off aircraft, and we can cut down on the number of incidents. For one thing, we can insist that a Red X be entered in the forms every time a panel is removed. Of course, the number of excuses for not making the entry will undoubtedly exceed the number of entries made — "lack of time," or "no one immediately available to clear the red X."

What will really solve the problem is each man taking pride in his work and doing it correctly, whether it is adjusting a valve, trimming an engine or simply fastening a panel. This includes supervisors who realize that supervisors have as many responsibilities as they do privileges; who supervise as closely as the job and the skill level of the men under them demand; who insist that persons qualified to sign off red crosses perform their inspections thoroughly and conscientiously.

Then perhaps the number of panels lost in flight will be reduced to where it is safe for the populace to walk about without helmets. ★

EXPLOSIVES SAFETY



ONE MAN — ONE ACT

Once in a while one man, performing one act, causes a mishap with no outside help. But usually it takes more than one unsafe act — a series of three, four or more — before the stage is set and the damage occurs. Each act in the series is usually a small error of commission or omission which alone would cause no harm. Like confirming a write-up in the 781 that says an aircraft has been dearmed; even if a cartridge is still in the breech of the centerline fuel tank jettison system, there are enough safety devices in the system to keep the cartridge from firing.

Well, don't be too sure. It was a series of omissions that recently caused a 600-gallon tank full of JP-4 to be slammed to the ramp from the belly of an F-4. First, the load crew that dearmed the bird neglected to remove the centerline cartridge. Then, after they left, the aircraft crew chief made an entry in the Form 781 to the effect that the aircraft had been dearmed, but he neglected to check the centerline station. Still later another load crew came along and loaded the Phantom for its next mission. Noting the "dearmed" entry in the Form, the load crew chief neglected to check the breech of the centerline station, too.

The number two man of the load crew was in the cockpit and had activated the armament override button. When power was applied to the aircraft, the tank went. It turned out that a micro safing switch in the centerline rack was shorted. But wait, even with that short and the armament override button, the circuit wasn't yet complete to the cartridge that wasn't supposed to be there. The troop in the cockpit inadvertently leaned against the external stores emergency release button on the panel!

No single one of the failures or unsafe acts could have caused this one alone. And, of course, had all of them occurred as they did, but the cartridge had not been installed.

And purposeful attention to their checklists by everyone involved would have not allowed *any* of the unsafe acts in the series to occur.

UN-SAFE PIN

A FLIGHTLINE maintenance trainee was climbing out of the front cockpit of an F-4E recently, placing one hand on the canopy rail and the other on the top of the control stick. Imagine his surprise when the M-61 gun in the nose of the bird emitted a short roar and fired several rounds of 20mm training ammunition. They impacted 50 feet in front of the airplane and ricocheted off the ramp. Some went as far as 7000 feet!

Several violations of TO 11A-1-33 were involved:

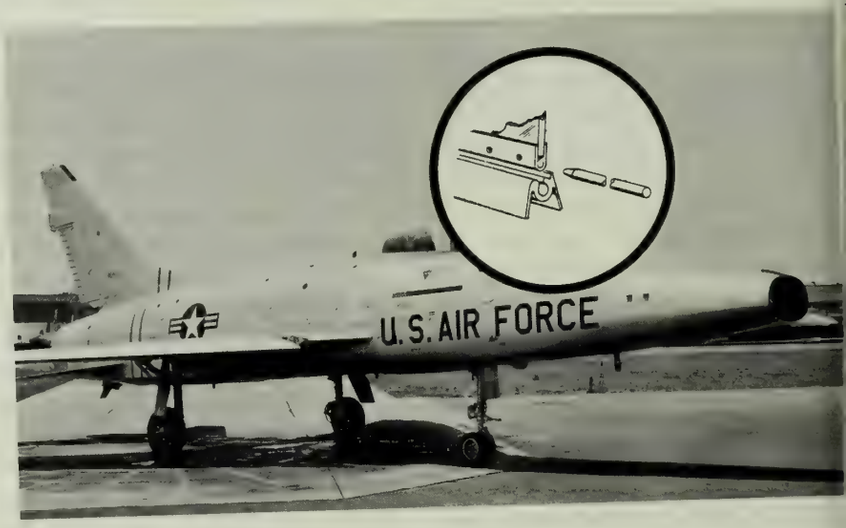
- The gunfiring lead was not disconnected,
- The clearing sector holdback tool was not connected,
- The armament master switch was not in the safe position, and
- A qualified maintenance technician or weapons mechanic was not present while maintenance was being performed on a loaded aircraft.

That's bad enough. But the gun would not have fired if the gun safety pin had been correctly installed. It's possible to install this pin on the F-4E gun so that it appears all the way in, but is actually not holding the electrical safing switch depressed.

It's easy to check — just grasp the head of the safety pin and pull. If the pin dislodges with a firm pull, the gun's not safe. ★

MAINTENANCE briefs

F-100 · canopy caper



SHORTLY AFTER TAKEOFF, while making an afterburner climb to 25,000, an F-100 lost the aft canopy bubble. The mirror attached to the top of the aft canopy glass struck the rear seat pilot shattering his helmet visor. Fortunately, he had the visor down. He received a cut on the forehead and pieces of glass from the mirror in his eyes but no eye damage.

The student pilot in the front seat took over and made an uneventful landing. Investigation revealed the canopy glass retaining rods, P/N 243-31802-35, reference TO 1F-100F(1)-4, Fig. 92, Nr. 17, were not installed properly. Instead of through the glass retaining loops they passed outside of the loops, which allowed the aft canopy glass to separate from the canopy frame during climbout. This was the first flight after installation of the canopy which had just been received from an overhaul depot.

Maintenance bought this one because the faulty assembly was not discovered prior to installation.

INTRODUCING MICRO FOD



unseen enemy of hydraulic fluid CONTAMINATION

F-100 · "lumpy" controls

AFTER ENGINE START, the F-100 pilot checked the flight controls and described them as "lumpy," not smooth in the fore and aft direction. But they smoothed out and he attempted to take off. At rotation stick force was extremely heavy as though the stick was binding on something, so he aborted. The aircraft was returned to the ramp and Maintenance dug into it to find out what was wrong. They found that the lower half of the control stick torque tube was inbedded in ice.

When hydraulic pressure is fir

pplied to the flight controls dur-
ng start, the controls move to a
redetermined position. This ap-
arently broke up the ice and
llowed free movement. The vibra-
on and G forces during the take-
f roll caused some of the pieces
move and again restrict the flight
ntrol torque tube. There are no
ckpit drains in the floor channel
the immediate torque tube area.
his unit has added a check for
ater, ice and other FOD to the
reflight checklist. The question is,
w did that much water get there
the first place?

B-52 • priming for an accident



DURING AN ATTEMPT to defuel a B-52 with an F-6 defueling unit, positioned about 20 feet from the aircraft, with a fire truck standing by, the F-6 pump could not be started. Using a two gallon plastic bucket containing JP-4, the refueling unit operator attempted to siphon fuel from the bucket in an effort to prime the pump. When this method proved unsuccessful, the unit operator sent a helper to the fuel cell dock for a funnel.

In the interim the bucket of JP-4 fuel was placed on the pavement next to the F-6 and the operator stood on the metal lid covering the battery compartment. His weight caused the lid to sag onto the battery terminals, thus completing an electrical circuit. The bucket of fuel was immediately ignited by either sparks or pieces of molten metal. The operator jumped down and drove the refueling unit away from the fire while the foam truck moved into position and extinguished the fire.

(Adapted from 8th AF (SAC) Safety Bulletin)

T-38 • cotter pins are cheap insurance

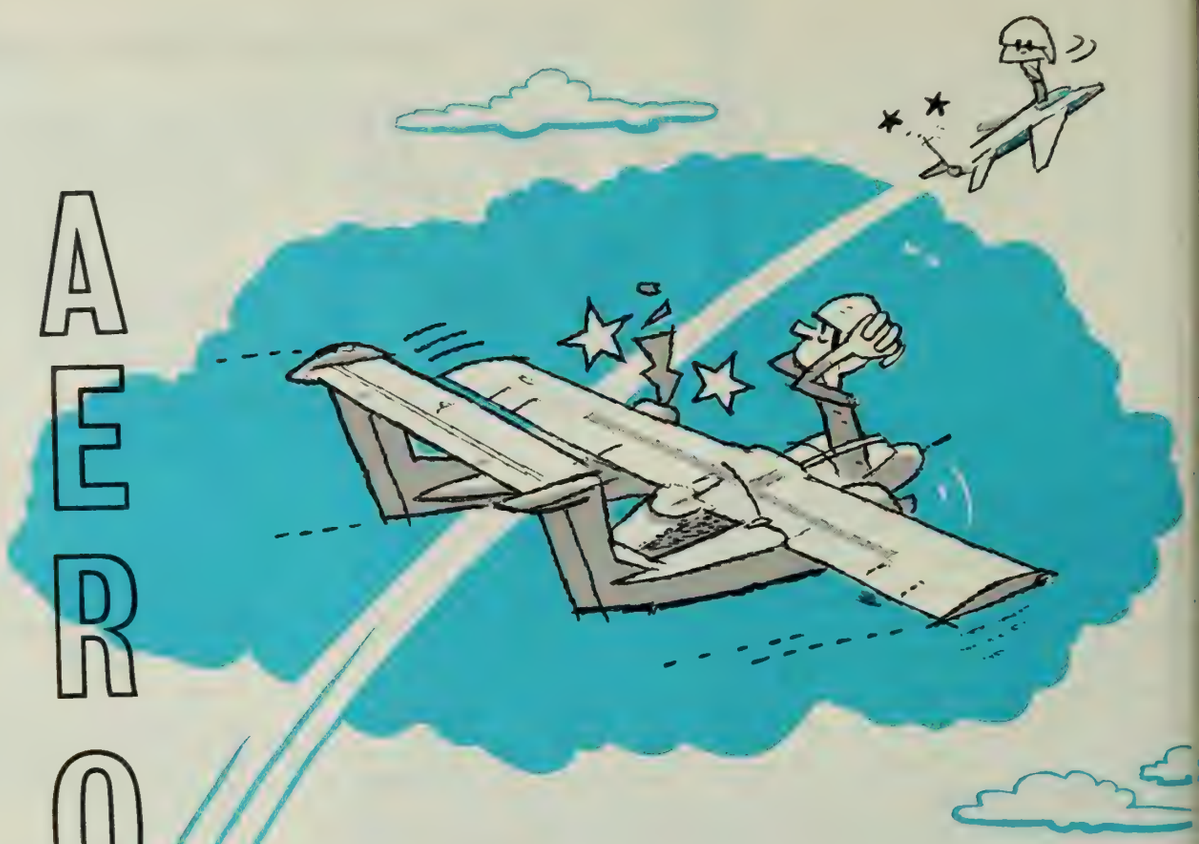
AFTER A TOUCH AND GO
nding, as the pilot turned to the
sswind leg, he noticed a rolling
ndency and heavy left wing con-
tion. The situation deteriorated
til full right stick and rudder
uld not maintain wings-level
ght. The pilot transmitted his
fficulties and ejected while the
craft was rolling out of control.
landed uninjured, but the air-
ft was destroyed.

This aircraft was lost because
cotter pin for the control bolt
nnecting the right wing aileron
vo valve to the push rod was not
talled, or was improperly in-
lled. This allowed the nut to come off and the bolt to come out. The uncontrollable servo valve then caused the actuator to drive the right aileron to the full down position and keep it there, resulting in complete loss of aileron control.

To avoid ever making such a mistake as that made by the man who did the job that led to this accident, remember: If you perform maintenance on any control linkage, make the proper red cross entry in the forms. After you have completed the work to your satisfaction, have a qualified inspector inspect the work and clear the forms. ★



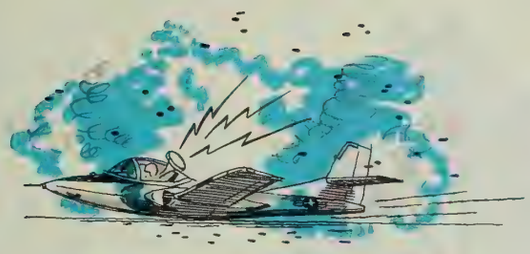
AEROBITS



HOW CLOSE? The FAC, in an OV-10 with a combat photographer in the back seat, was controlling a flight of two F-100s, his third for the day. He cleared the flight for random passes with each pilot to give his run-in direction, then flew from north to south, marking the target and advising the fighters to hit his smoke. He then began a left turn around the target.

The flight leader made the first pass; then the wingman called in from the west while the FAC was south of the target, heading east. The FAC saw the wingman coming from the northwest and cleared him hot, advising that he would have the FAC at 12 o'clock when he came off target. As the wingman continued his run-in the FAC again advised that he would be at 12 o'clock when the fighter came off the target. As Wing pulled off the FAC repeated the advisory. Although both the FAC and the photographer heard acknowledgment neither Lead nor his wingman recalls hearing the FAC's transmission.

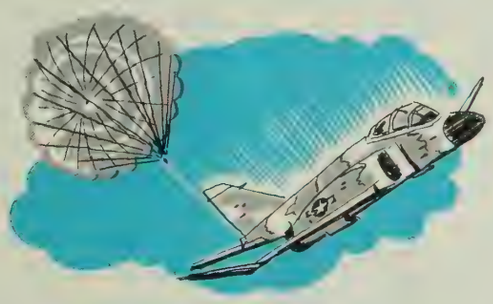
As he came off the target, the wingman rolled left, which the FAC thought would be a left break. However, the wingman said later that he just turned to check his bombs in his mirror, then rolled back erect. When he did this the FAC called 12 o'clock, ". . . lost out," and pulled back on the stick. The wingman saw the FAC and pushed over, passing under the OV-10. The trailing edge of the fiberglass fairing on top the F-10 vertical stabilizer struck one blade of the Nr 2 prop on the OV-10.



TWEET-SLIDE. There's more than one way to get the gear horn to stop blowing, as one unhappy T-37 IP learned not long ago. Arriving at destination on a cross-country flight, the student made a VOR touch and go. Then the IP took it and requested a closed pattern for another touch and go. Level on downwind, he reduced power and extended the boards. He put the gear handle down and lowered flaps as he started to turn back toward the runway. Strong wind down the runway called for more power and the IP pushed the throttles forward on a high final. Then he continued the briefing he was giving his student on landing over the barrier cable and the next pattern they would fly.

When he reduced power in the flare, the horn sounded. It was too late to take the Tweet around. They found the gear handle in the full down position after they slid to a stop and the dust had settled. But the best guess is that it was not all the way down before touchdown since the gear did not come out of the well, and the horn didn't sound because of the high power setting on final.

Now, about the gear position indicators — —



PHANTOM WHOOPEE. The F-4 student, with his instructor laying GIB, had gone through a series of chandelles and lazy eights. Then, with tanks dry, they completed a normal stab aug rig check. The ball centered with ailerons neutral. Their advanced maneuvering practice went without incident, but when they got into their first confidence maneuver, a high angle of attack rudder roll, heartbeat and respiration rate increased dramatically.

Starting with about thirty degrees of pitch, they initiated the roll as airspeed bled through 200 KCAS. One-quarter of the way through the roll they had 17 units AOA. When they were three-quarters of the way around, roll rate increased rapidly. At one and one-quarter roll the bird snap-reversed.

Although the IP attempted to obtain five to ten units, there was no apparent response to his control input. He ordered the student to deploy the chute as the nose came through the horizon, wings vertical at about 110 knots. Recovery was as advertised.

On the ground and breathing normally again, the two learned that trim pots in the autopilot control amplifier were out of adjustment. With roll aug engaged in flight the right aileron drooped one and one-half inches.

The 1 Nov 69 change to the F-4 Dash One warns about the possibility of adverse yaw when you attempt rudder reversals with roll aug engaged, producing a cross-control or pro-spin condition. Joint Manual 55-154 says to disengage the roll aug before engaging in ACT or other high angle of attack maneuvers. But the training manual for the course of instruction in which these two were engaged left roll aug optional, saying it "may" be disengaged.

Sounds like a good idea to turn off roll aug before you start high AOA maneuvers—and don't forget to turn it back on again when you're finished.

Toots



Dear Toots

It's time to spotlight another problem area that has been around a long time and represents a great hazard to personnel and equipment. Several years ago an excellent Liquid Oxygen System Tester, P/N TTU-162/E, was issued to most units possessing aircraft with liquid oxygen systems. It was designed to test liquid oxygen converters in a bench test environment after repair. However, adequate directives for the environment where it was to be used still have not been published. Directives exist on how to use it, but none explain how to service a bench test setup when all other directives prohibit servicing aircraft within 50 feet of any structure. No directive is explicit on test room construction, type of lighting (explosion proof?), type of ventilation, or the room's location in regard to other activities. It's a safe bet that, in the absence of proper standards, a lot of our test facilities are unsafe. How about helping to obtain clear-cut directives for establishing a test facility of this type?

SARGE

Dear Sarge

According to the experts at OCAMA, the LOX converter field tester, P/N TTU-162/E was designed for flexibility and will perform efficiently indoors or out. The tester is small, self-contained, compact and enclosed in a carrying case. The tester will operate as well in the back of a pickup as on a workbench. The only facility required is an area meeting the requirements of TOs 15X-1-1 and 32D2-10-46-1 (more detailed reference in para 2), a space for the tester and converter to sit in a level upright position where the converter can remain undisturbed for a two-hour stabilization period and a rack to hold the required 80 feet of one-half inch OD tubing. The authorized field level repair consists of bench testing and replacing component assemblies. There is a minimum of exposure of internal parts; therefore, the environmental requirements are less stringent than for an overhaul facility.

The use of good shop practices and observance of the precautions and instructions contained in Section V, TO 15X-1-1, 20 June 65 changed 1 December 69 and paragraph 3-4 and 4-2, TO 32D2-10-46-1 February 64 will provide a satisfactory environment for testing with the TTU-162/E tester. Converters to be tested may be filled in any area approved by ground safety for the handling and use of liquid oxygen.

The TTU-162/E tester was purposely designed to be usable in a less stringent environment than that required for depot overhaul of oxygen equipment. Field level bench testing and the replacement of malfunctioning components would not be economically feasible if an elaborate facility was required at each installation.

Toots

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UNITED STATES AIR FORCE

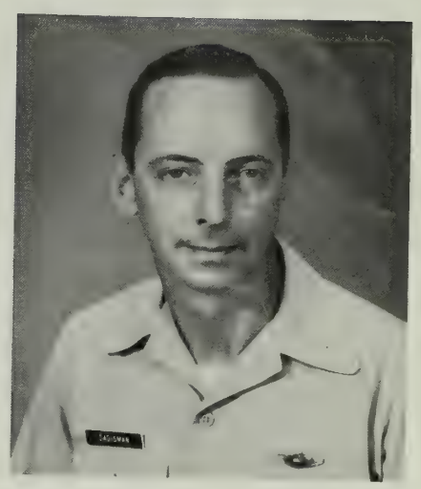
WELL DONE AWARD

Presented for outstanding airmanship and professional performance during a hazardous situation and for a significant contribution to the United States Air Force Accident Prevention Program.

Major

Floyd Dadisman, Jr.

44th Tactical Fighter Squadron
APO San Francisco 96288



On 16 June 1969, Major Dadisman was flying lead in an F-105F on a combat mission in Southeast Asia. At level-off, after leaving the target, a fuel check showed Lead with 6500 pounds. While Nr 2 was joining up and checking Lead for battle damage, fuel continued to decrease alarmingly, reaching 5000 pounds when the flight was still 80 miles inside hostile airspace. Knowing that, with the rate of fuel loss, he might not make friendly territory, Major Dadisman called GCI for a tanker to be vectored toward him. When the fuel was down to 3500 pounds, a rumbling explosion was felt and the engine flamed out. With emergency fuel selected, Major Dadisman got a relight but the engine would run only one or two minutes before flaming out again. Maximum speed that could be maintained was 320 knots at full military power. Fuel quantity was diminishing rapidly; meanwhile, Major Dadisman was being vectored around numerous thunderstorms toward the tanker. Since he did not have sufficient power to overtake the tanker, it orbited in a clear area so that Major Dadisman could use a cutoff angle for joinup. At hookup Major Dadisman's fuel was down to 1000 pounds. The tanker began towing the F-105, so Major Dadisman was able to throttle back, which kept the engine from flaming out. The tanker towed the fighter to within 40 miles of an alternate, where he dropped off with 11,000 pounds of fuel at 14,000 feet. As soon as power was advanced the engine flamed out, but could be restarted at 85 per cent RPM. From the dropoff point to landing, several flameouts and restarts occurred and 5000 pounds of fuel was consumed. A precautionary landing pattern was established and with continuous use of the airstart button, a successful landing was made.

Subsequent engine inspection revealed an afterburner fuel regulator valve frozen open. This prevented afterburner operation while permitting both afterburner and normal/emergency fuel scheduling, and excessive fuel consumption without an increase in power. In addition, this condition reduced the total fuel pressure available to the normal/emergency fuel control units, further limiting power available to about 85 per cent despite maximum thrust settings. Moisture in the main fuel shutoff valve cannon plug caused that valve to intermittently close, resulting in multiple engine flameouts. Major Dadisman's professional knowledge of the aircraft systems and outstanding flying skill during a serious emergency preserved a valuable aircraft and possibly saved the crew. WELL DONE! ★

RADIO OUT ?



Squawk CODE 7600

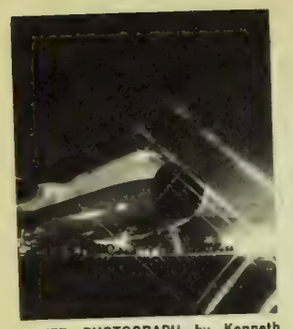
THE FAA CONTROLLER'S HANDBOOK NOW CONTAINS SPECIFIC PROCEDURES TO BE USED WHEN RADIO FAILURE OCCURS AND YOU SET YOUR TRANSPONDER TO 7600. (CHECK THE FLIP IFR SUPPLEMENT)

UNITED STATES AIR FORCE • JUNE 1970

Aerospace SAFETY



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UNITED STATES AIR FORCE

Aerospace SAFETY

JUNE 1970

FOR AIRCREWS, MAINTENANCE & SUPPORT TECHNICIA

SPECIAL FEATURES

THE NAME'S THE SAME . . . but it's a new, bigger book
C-5 JUMBO IS HERE . . . get acquainted with the big one
SUMMER STORMS . . . avoidance is the key
BIRD STOPPERS . . . making drag chutes work
COMBAT TRACTION . . . how slippery is slick?
THE "WHY" OF MAINTENANCE PROCEDURES
WHAT'S MEP? . . . a help for maintainers
GRASS YES . . . FINGERS NO . . . summertime menace
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OPS TOPICS
MAIL CALL
WELL DONE

DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

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JUNE 1970 AFRP 127-2 VOLUME 26 NUMBER

the name's the same

AEROSPACE SAFETY, Aerospace Maintenance Safety and Nuclear Safety magazines merged three months ago and we asked you to help us find a name, one that would reflect the expanded subject matter of the new magazine.

You gave us some 1100 different suggestions, so selecting a title wasn't easy. But the die is cast, the new name is indelibly printed on 65,000 copies of this issue. The name is AEROSPACE SAFETY.

To all of you who sent in suggestions—Thanks. Our original intent was to send a personal thank-you to each of you. But with such a response, that is beyond the realm of practicability. So please accept this in appreciation of your interest.

With so many entries the variety was outstanding. Some were way out, others were quite conservative. Perhaps some of you were pulling our leg, like "Age of Air-quarius." How about that plastered across the front every month? We like to blow our horn but "Aerospace Klaxon?" Really!

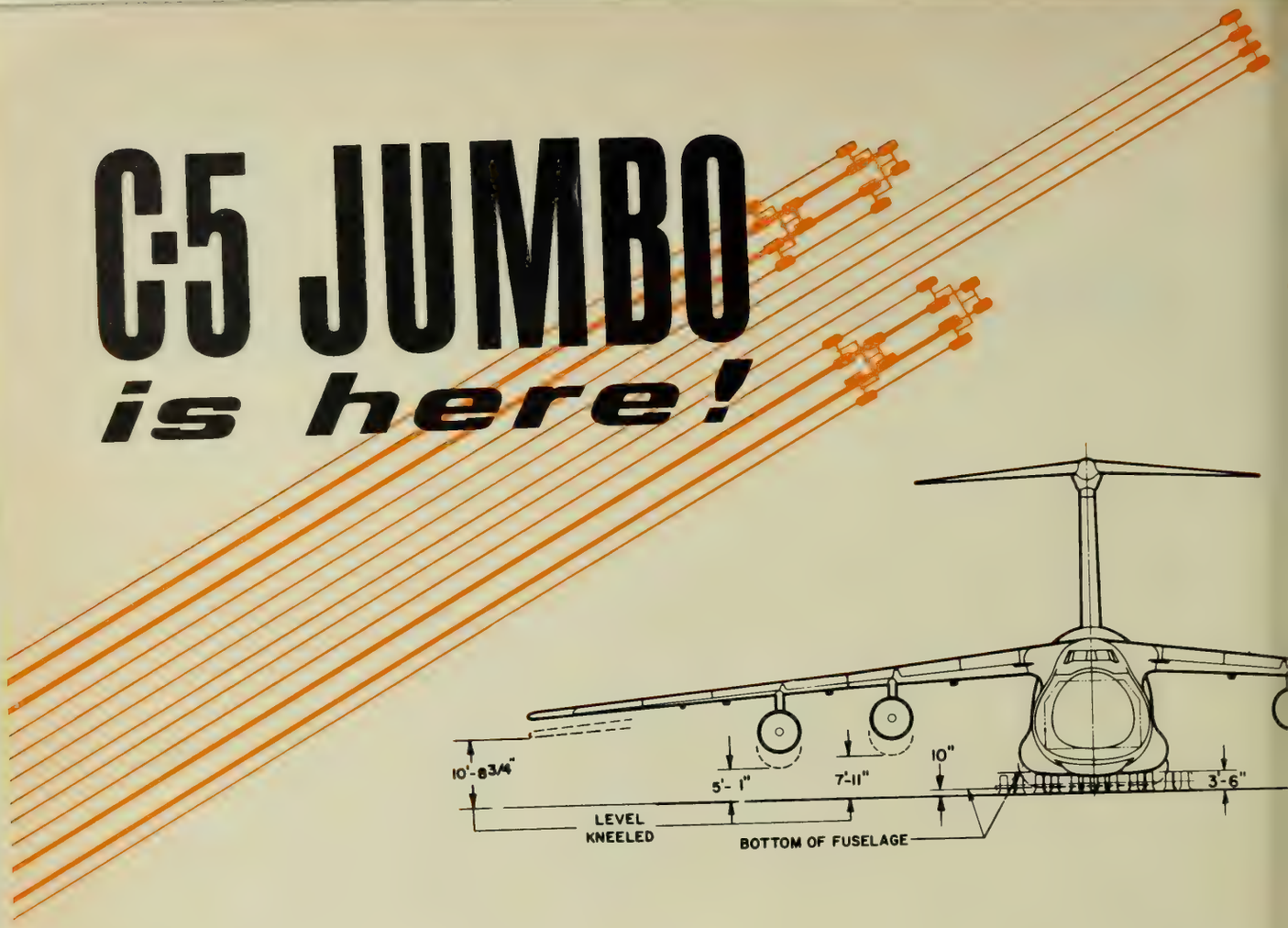
We got a lot of acronyms, those words made up of a group of initial letters. Like "BASH" (Bluesuiters' Aerospace Safety Hybrid), and "FAN GEMS" (Flying Aerospace Nuclear Ground Explosive Missile Safety).

Many of the suggested titles were accompanied by drawings of possible designs. One officer got his whole family in the act and sent in an entry for himself, his wife and one each from the children. They spent an evening at it and with each title was a drawing illustrating how the title would look.

Finally, the title AEROSPACE SAFETY was retained because it was considered to best represent, in fewest words, the many areas of interest covered by the combined and enlarged magazine. In case you are wondering, it was also the most suggested title.

So the name's the same but the magazine is different. We hope you'll like the new format which includes all the major areas of accident prevention in one publication. And we are looking forward to hearing your ideas and suggestions for making it as informative and useful as possible for you—the reader. ★

C-5 JUMBO *is here!*



For several years we have been seeing items in newspapers and magazines about the C-5. Milestones along the way included the letting of the contract, roll-out, first flight, and testing, along with numerous articles attesting to its awesome size and tremendous capabilities.

An intensive training program has been in progress for some time for the crews and maintainers that will operate and keep this big bird flying. Finally, the C-5 is operational and you — Operations, Maintenance, Supply, Civil Engineering, Food Services, and so on — had better be ready for its arrival at your base.

Although the C-5 will be the biggest airplane you will have ever seen, and the size and capacity of its consumables will present some problems, it is not the purpose of this article to alarm anyone. It is a pretty broad coverage primarily to inform non-MAC base personnel of some of the things they will have to expect when these birds land at their base. Let's take it from the time it appears in the area through departure.

First to feel the impact will be the air traffic controllers—the guys in Approach Control and the tower. This bird is big and heavy and it is propelled by four 41,000 pound thrust, 8½ to 1, by-pass fan engines. So it's going to have a lot of turbulence behind it that will demand much respect. Traffic patterns will have to take any nearby general aviation airports into consideration.

Various suggestions have been made for operations of other aircraft when a C-5 is taking off or landing. Among these are

- A two-minute interval for takeoff behind a C-5.
- Landing beyond the C-5 touchdown point and, consequently, beyond its wake turbulence.
- Takeoff prior to where the C-5 breaks ground, and climbs above the C-5 flight path to keep above the wake turbulence.

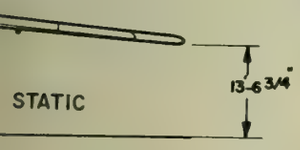
Once the aircraft is on the ground a lot of other people get into the act. The wingspan of this bird is 223 feet. Therefore, the wings will extend beyond the borders of many runways, certainly beyond the edge of the taxiways, and will overlap present ramp taxi lanes.

Normally, except at a somewhat primitive base—and the C-5 was designed to operate into unprepared fields—obstacles off the sides that could strike a wingtip should be no problem. But something else is: vehicles and taxiing aircraft should stay well back from intersections, not only for clearance but because it takes some power to move this bird. Operating weight, without fuel or payload, is about 325,000 pounds and it can gross up to 769,000 pounds, so you can see that quite a bit of push will be exerted when it is taxiing.

Jet wake velocities have been a matter of concern; the Directorate of Aerospace Safety recommends that aircraft and vehicles avoid jet wake with a velocity of over 5 mph. This speed has been measured at 150 feet behind the tail of the C-5 with engines at taxi power. Even at idle power, you can expect wind velocities of 50 mph at the tail of the aircraft and 35 mph at 25 feet behind the tail (see jet wake illustrations, page 5).



letized cargo rolls from the
vly developed Air Transport-
e Dock onto a C-5 at Mari-
a, Ga., for flight to Pope
B/Ft. Bragg, NC. The dock
be transported by C-5
axys to forward areas, off-
ded and set up to handle
ving palletized supplies.



ensions reflect ground clear-
es on a smooth surface at a
ss weight of 730,000 lbs with
,000 lbs wing fuel load.



Marshaller is a long way down from cockpit of C-5—about three floors.



High-lift Calavar is part of AGE for C-5. Horizontal stabilizer is 65 feet above the ground.

So don't taxi or cross too close ehind the C-5. Your bird or your uck could be upset and you could e subject to a lot of blowing debris –remember, the outboard engines re 70 feet from the aircraft center ne and they will hang way over on 75 foot taxiway. Recommended pacing for aircraft taxiing behind a -5 is at least 600 feet, or 2½ ngths of the C-5.

If you have a congestion problem, en it may be necessary to tow the g fellow. And this is going to be nite an operation. You've seen a t of towbars but you've never seen ything like the one for the C-5. rst, there's a special towing trac- r designed to tow aircraft weighing to 750,000 pounds. The tractor eighs 70,000 pounds and has ,000 pounds of removable ballast. is powered by a 575 hp diesel en- ne. The towbar is 40 feet long, eighs 4400 pounds, and is air nsportable only in the C-5. This ng is a real monster and you'd tter have highly qualified operat- s if you own one of these rigs.

Another piece of AGE that you'd tter get familiar with is the *Cala-var*. This is simply a high reach truck with an extendable arm mounted on it. The unit is about 40 feet long, 8 feet wide, has a 125 foot reach and is C-5 air transportable. It can be used for maintenance and is essential for deicing the aircraft.

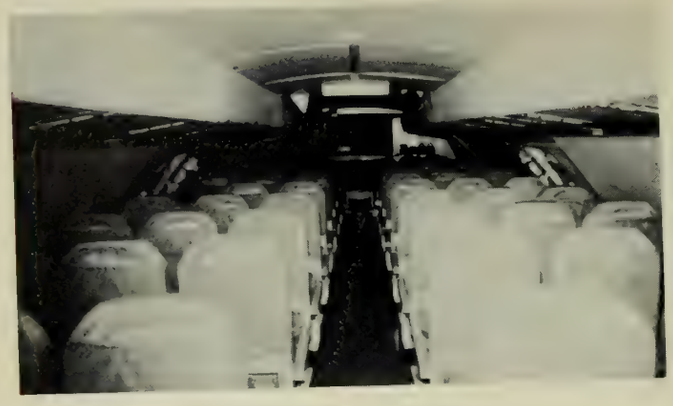
Now you've got the airplane to the ramp and are ready to park it. Be prepared to allocate 1.25 acres for this bird. Two or three of them are going to eat up a lot of ramp. If you are really ready for the C-5, getting it into position shouldn't be too difficult. But there are some things you had better plan for. Like the jet wake, if the bird is taxiing. Maintenance stands on the ramp, or cans, fire extinguishers and other items that may be parked on or near the ramp can easily be blown over or into various other things such as people, buildings, cars, airplanes. You will want to be extra careful about ramp cleanliness.

And there will be a lot of noise. Big engines—big noise. So marshallers will need ear protection. Also a marshaller in front of the airplane is going to be a long way from the cockpit. From the pilot's seat it is like looking out of a third story window at a man halfway down the block. Throw in the sun glaring through a dirty windshield, or heavy rain and the pilot could have difficulty seeing the traffic director's signals.

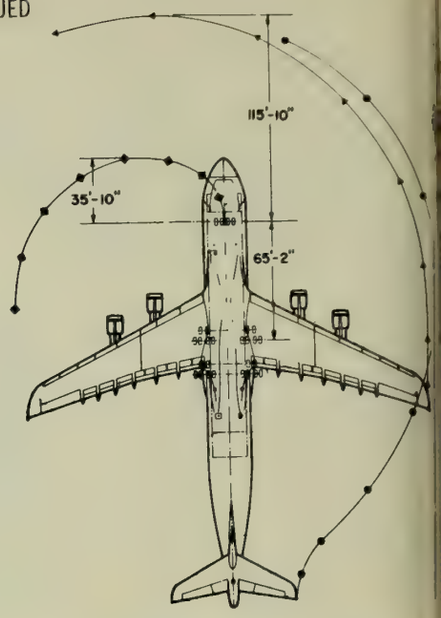
Right now it looks like a towing team will consist of two people in the cockpit, a tractor driver, a towing director, two wing walkers and one at the tail. And they are all going to have to be able to communicate with each other. We're not certain how this is going to be done, but MAC is considering the use of portable radios of some sort. This alone could be a major item in that the ideal equipment would probably be built into a helmet that would provide earphones and noise protection with a boom for a mike (an item of this kind has been under test). Several would be needed and would have to be well maintained.

Now the airplane is parked. Do you know what it contains? Is it parked in such a way that both the front and rear ramps can be utilized, if that is required? If only the front ramp is needed, is the bird parked

C-5 CONTINUED



Aft passenger compartment on upper deck.



TAXIING TURNS 60° NLG ANGLE

Gross Weight	450,000 lbs.
Surface	Dry pavement
Aft MLG	Free caster
Max. NLG angle	60°
Thrust	Asymmetrical
Taxi Speed	4.5 mph

so that using that ramp is not blocked by a building or equipment. Remember the bird may be carrying Army tanks or trucks, or perhaps heavy palletized containers that require the use of 463L equipment.

Earlier we mentioned the word *consumables*. Very briefly, here are some of these and maximum amounts that could be required. Fuel —49,000 gallons; engine oil—9.1 gallons per engine tank; constant speed drive oil—1.5 gallon per each CSD tank; APU oil—.5 gallons each, two tanks; oxygen—100 liters for crew and upper aft troop compartment; potable water—224 gallons total for galleys in flight station, troop compartment, cargo compartment and 36 gallons for lavatories; frozen meals—300 for crew and passengers; rain repellant—500 cc in two pressurized bottles; hydraulic fluid—283 gallons.

Servicing has been pretty well simplified on this bird, but there are some special requirements. For example, there are two refueling adapters in the left main gear pod and two in the right pod. With the aircraft kneeled (you've probably heard that the C-5 has a unique kneeling system by which the fuselage can be lowered to within 10 inches of the ground) the refueling adapters are 38 inches above the ground. If the bird is not kneeled you'll need either some tall guys or something for them to stand on because the adapters are 72 inches above ground level. Fueling can be done from hydrants or trucks at 55 psi with a flow rate of 600 gallons a minute each for a total of 2400 gal/min. Refueling from hydrants should go quickly, but what if you are doing it from trucks? During a quick turnaround you'll have several fuel trucks converging on and leaving the aircraft, along with other assorted vehicles and people. To keep everything sorted out and orderly will require planning, training and practice to insure an efficient, non-hazardous situation.

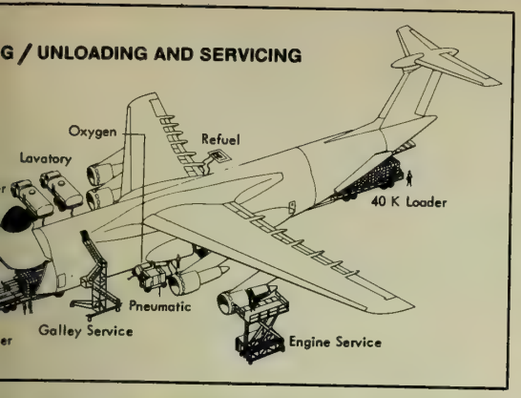
One of the unique things about the C-5 is its kneeling capability. This can be used in more than one way: Kneeling for on and off-loading and as an asset to you maintenance types, this feature makes a dandy jack for tire changes. But, as is frequent with something out of the ordinary, kneeling the aircraft will require careful direction and execution. You can imagine the results if the aircraft were kneeled with an engine stand under an engine. Or with work being performed in the wheel wells.

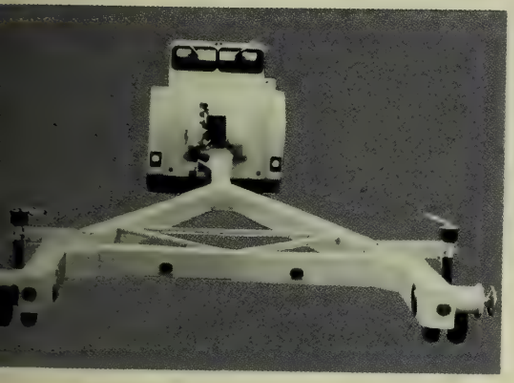
In case of fire (and remember, a C-141 was destroyed by fire on the ramp of a major Air Force base) is the fire department equipped with everything it needs to handle a fire in an airplane this big? And have fire crews been thoroughly trained in the location of hatches and windows, heights and distances—things they will have to know about the C-5? (The Feb/Mar 70 USAF Safety Kit contained material on this subject.)

Because of its size and certain features, servicing this aircraft will present some problems. Someone, probably the loadmasters, will have to direct all servicing and on-load—off-load operations, especially when all of these are taking place simultaneously. In certain circumstances an awful lot of people will be in and around this bird. Replenishing consumables alone will put many people and their equipment on the scene, and if maintenance is required, there will be that many more, some of them conceivably more than 200 feet apart. Obviously careful surveillance is a must to prevent injury to people and damage to the aircraft.

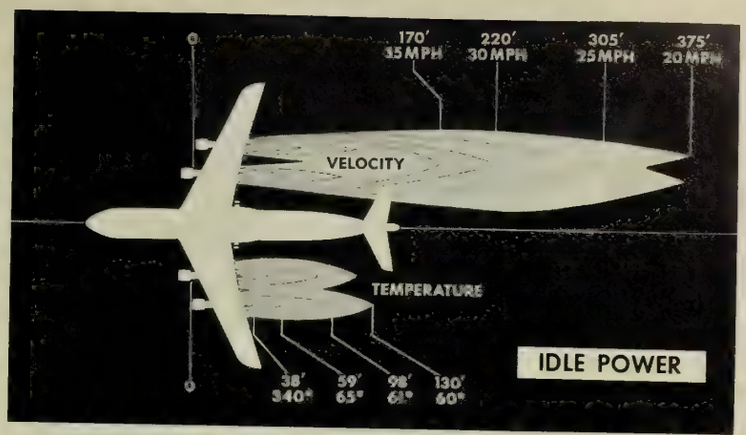
Admittedly what is to follow is very remote, but let's hypothesize for a moment. Suppose a C-5 had to make an emergency landing at your base and await a MAC maintenance team and parts before it could depart. To paint the picture really black, let's fill the aft upper troop compartment with 75 troops, with another 20 people up front. Most bases cannot be expected to provide instant housing and food services for this many people dropping in out of the blue. But it could happen. This doesn't mean every base has to be spring loaded to handle such a situation, but it would be a good idea for the housing and food services people to have a plan for just such an emergency in order to expedite things as much as possible.

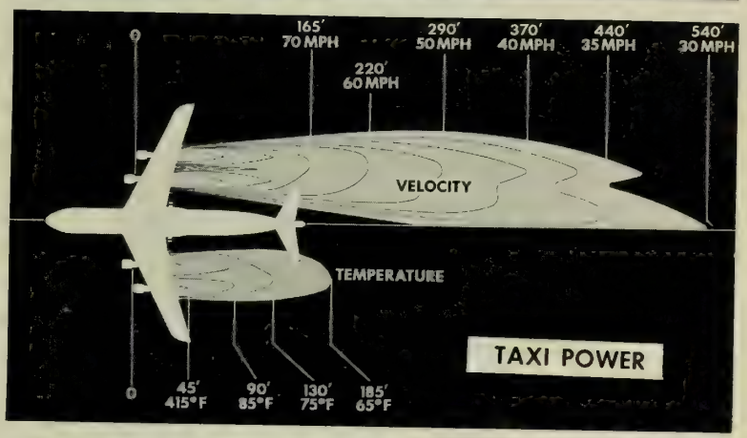
Now let's move the C-5 out and off your base. But before we go here are a few details we didn't cover on the way in. This airplane is 242' 10" long and the horizontal stabilizer is 68' 8" wide and 65 feet high. You are familiar with the wing-growth phenomenon of swept wing aircraft

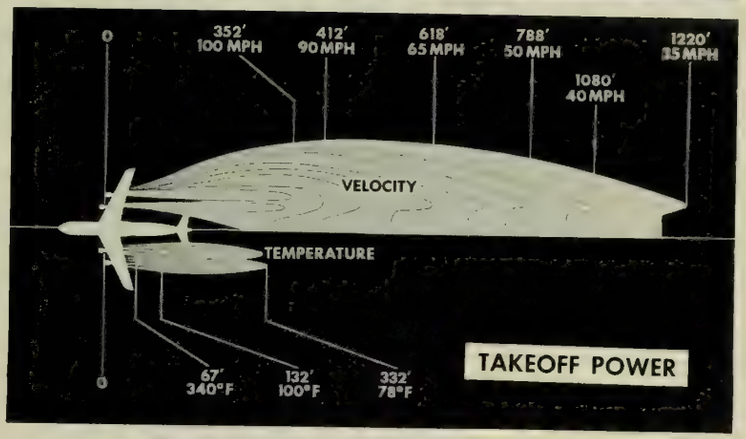




Tractor and 4400 lb tow bar. Unit is air transportable in C-5 only.







Charts above show velocity and temperature of air in C-5 engine wake.

but this bird's tail grows, too. In fact, it can grow beyond the arc of the wing tip when the bird is turning. Under certain conditions this can be as much as six feet. (See the Dec/Jan 69-70 USAF Safety Kit item on turning radius for details.)

There are some other figures worth remembering here. With full tanks, the outboard engine nacelle clears the ground by 7′ 11″ and the wing tip clearance is 13′ 6″. From the aircraft centerline to the wing tip is a shade over 111 feet. On a 75 foot taxiway, assuming the bird is in the center, the wing is going to overhang the edge of the pavement nearly 74 feet. The outboard nacelle will be 29 feet past the edge.

The problems and hazards these dimensions present have caused MAC to recommend preferred taxiways for the C-5. Crews will be furnished airfield diagrams for selected bases. Tower ground controllers should not only be familiar with all taxi routes but should understand C-5 requirements.

Whew! It's off and gone. You have just survived your first visit by the world's biggest airplane. There were a couple of things at the last minute but you were prepared for them. Traffic on the public street just a few hundred feet off the end of the runway was stopped so you won't have any claims for damaged or overturned cars or motorcycles. And the tower had to hold up takeoffs behind the departing mammoth two minutes, but nobody was in any particular hurry to go off after that bird.

If all of this seems like a bad dream, take comfort in realization that the C-5 is an airplane. Not just any old airplane but, nevertheless, something you are familiar with. To make sure you know what to expect —and what to expect from you— MAC has surveyed the bases in the MAC system and prepared an Airfield Suitability Survey Checklist. Study it and see how you stand. The April-May USAF Safety Kit contained a copy. Also, for those who have a requirement, an airfield suitability kit and survey checklist are available from MAC hq. Write MAOASN at Scott AFB for a copy. ★



SUMMER STORMS

understanding the assistance available to you will help you avoid them . . .

Thunderstorm season across the great central plains area of the United States is well under way. Some of us have already tangled with the turbulence, lightning and heavy rains this season. Over the years, most of us have jousted with thunderstorms at one time or another—with varying degrees of success. Sometimes the storms have won!

If there's been any learning outcome from these encounters with some of nature's wildest displays of authority, it has been that we have nothing to gain from these bouts. Maybe you could call it a matter of degree. Up to a certain intensity, with a given airplane, you can test the power of a thunderstorm and come away in one piece. Not unscathed, mind you—we've all seen pictures of airplanes that were intentionally flown through thunderstorms during tests. Dented and bat-

tered by hail, in some cases they were overstressed. Seldom were they in condition to immediately turn around and perform a tactical mission after their thunderstorm penetrations.

If necessary, we could probably work up elaborate charts depicting the intensity of a storm (using whatever parameters seemed best at the moment) that this airplane or that airplane could successfully penetrate and still be expected to perform its mission one hundred percent.

Then all you'd need would be the ability to accurately tell from the outside just what the inside of a thunderstorm is like. And that's where the catch is.

The weatherman does a tremendous job of identifying the conditions which will be conducive to thunderstorm generation. He can tell you what general intensity to expect in the storms when they form. And within the range of each weather radar, he can refine his forecast by the minute as the storms develop. But he can't tell you exactly what you'll find inside any one specific storm cell at any given moment. The radar doesn't give him the information that is important to you—vertical gust velocity and location, differentiation between water precipitation and hail, severity of icing.

The trouble is that the characteristics important to us, those that can make an aircraft thunderstorm penetration successful or unsuccessful, are all extremely transitory in nature. Vertical currents within a storm cell are unpredictable, they change in size, intensity and location so rapidly that it would be almost impossible for one airplane to follow another through a storm and encounter the same conditions. And as the vertical currents change, so will precipitation patterns change—and the occurrence of damaging hail will change.

Okay, neither the studies that the weatherman conducts nor his radar can tell us accurately what to expect inside a thunderstorm. And we know that without being able to pick our way carefully through a storm, to traverse only the most benign areas, we may without warning stumble into conditions that our air machines are not built to withstand: gust loadings, shear and gust reversals, severe and damaging hail. And it's obvious that Air Traffic Control radar can do no more than weather radar in this respect. Even when the radar operator is devoting his full attention to trying to keep you out of trouble, he can tell you of little more than the existence of a storm. You need to know a lot more than that before you poke an airplane into a thunderstorm.

It's pretty easy to avoid a thunderstorm when the buildup is standing bright and clear, unshrouded by other clouds. That kind of a storm is simply a no-excuse situation. With the uncertainty over what's inside, and knowledge gained from experience, it's just plain foolhardy to venture into a storm when you know it's there.

So what about the thunderstorm that is buried in other clouds, high altitude cirrus or stratus at lower altitudes? It is this kind of storm that most often gets us into trouble. We suddenly stumble into it without warning when we've been cruising peacefully along in smooth clouds. (The pilot carrying airborne radar along with him may have a better chance to avoid even this, but we'll confine ourselves here to only the most vulnerable—those without radar aboard.)

Just about as soon as we started using radar for air traffic control, we realized that it would be a terrific aid in helping us avoid damaging storms that are otherwise hidden from view, either by other clouds or darkness. As a matter of fact, we have been so successful in steering around (but not through!) thunderstorms with radar guidance from the ground, that, in some cases, we've overdone a good thing. Far too often in the last few years weather forecasters have heard pilots reply, "No trouble with that line of thunderstorms, I'll just have ATC vector me around the bad spots." These are the same pilots who have the loudest tales to tell at the bar of how ATC "let them down" last time they asked for (often demanded!) help.

There are very good reasons why an air traffic controller is unable to give you the undivided personal attention you ask for in getting through an area of storm activity. First, of course, the controller's primary responsibility is to provide you safe separation from other aircraft. He may not provide you any other services which would infringe upon his ability to do that. Second, communications congestion, limitations of the radar he is operating, or the volume of traffic, can limit his ability to give you special attention.

This aspect of communications discipline is pretty easy to understand. No need to discuss it at any length.

All ATC radar isn't the same, and the capability to display precipitation density varies. Circular polarization (CP) on many sets eliminates all but the heaviest areas of precipitation from the scope. When CP is turned off, very heavy returns may clutter the scope until it is unusable for even traffic separation.

All this is not to say that you should hesitate to ask for help in circumnavigating severe weather. Whenever he is able, the controller will do his best to assist you. And

you can do a lot to make the controller's assistance even more effective, by updating him on conditions as you encounter them. Due to the transitory nature of thunderstorm weather, intelligence the controller has received from pilots rapidly becomes out of date. By giving him specific information on altitudes, intensity and the nature of severe weather as you encounter it, you make the radar controller's assistance to the pilot coming along behind you much more valuable.

You can also help the controller, and other pilots in the vicinity or following you, by requesting route or altitude deviations as far in advance as possible. Enroute, you have an excellent chance of having your request granted when you allow some time for planning. Away from terminal areas less congestion allows more freedom to deviate. In higher density terminal areas more traffic coordination is required and complex departure and arrival routes make deviation much more complicated.

Within their capabilities, controllers will recommend route deviations to avoid severe weather when they are aware of it. When alerted to the existence of hazardous weather, they will often turn on their normal radar if they have been operating in secondary (beacon-only) mode, provided this doesn't result in making their scopes unusable for traffic control.

When you're dealing with thunderstorms, or flying through areas of other severe weather or turbulence, nothing is more important than good judgment. Avoidance is the key word, and understanding ATC's capabilities and limitations will go a long way in tuning up your judgment.

Go visit an ATC Center some dark and stormy night—you'll come away impressed! ★

LOST and DOWNED

BRIEFS OF RECENT AIRCRAFT ACCIDENTS

A-1

Power fluctuations during climbout caused the pilot to make a precautionary landing. He saw flame and sparks emitting from the left side of the aircraft at touchdown and when the flight leader called "get out," he extracted successfully. The aircraft was destroyed by fire and ordnance explosions. In his hurry to get on the ground, the pilot had forgotten to lower the landing gear.

RF-4

An angle of attack system malfunction caused the pilot to assume he was stalling out. He pushed forward on the stick and went straight in—apparently not cross-checking his other gages. The backseater ejected successfully.

T-33

During flight test of a new altimeter, the pilot attempted to test its performance by simulating a low level weapons delivery maneuver. He hit electrical cables; caused major damage to the aircraft. The pilot was flying too low in an area he had not visually cleared prior to his "test" run. Also, he had not been briefed on obstructions in the test area.

C-123

Thinking he could turn off at the first taxiway and save taxi-back time, the pilot abandoned his GCA approach to touch down near the approach end of the runway. He lowered flaps from "takeoff" to "land", called for props to full increase but added no power. Increased drag rapidly dissipated airspeed and produced an excessive sink rate. The right landing gear failed at touchdown.

C-123K

On takeoff roll the aircraft entered a left turn despite application of full right rudder, right brake, differential recip engine power and nose wheel steering. After traveling 629 feet through a marsh the aircraft came to a stop with jets at 100 per cent and recips at idle. The nose gear had a built-in 12 to 15 degree left turn due to improper adjustment procedures by maintenance. The pilot contributed: Dash One abort procedures call for propeller reversing which would have shut down the jets.



BIRD STOPPERS

Without drag chutes the aircraft accident picture for the past several years would no doubt have been much different. These things are life savers and bird savers. In a word—they work. But people sometimes render them inoperative.

Daily, throughout the Air Force thousands of drag chutes are installed and the percentage of good chutes is so high that we have come to depend on the chute for its slowing effect. In fact, some aircraft designs are influenced by the relationship of runway length to brake effectiveness-drag chute effect in stopping the airplane. Imagine then a pilot's feelings when he pulls the drag chute handle and nothing happens.

So, what is to follow is not about *happening* but, rather, about some non-happenings — drag chute failures that have occurred this year.

When the F-4 touched down and the pilot raised the drag chute handle—nothing! The chute simply fell undeployed onto the runway. Why? Because the drag chute door mechanism was out of adjustment.

The same thing happened to another F-4, except that the cause was slightly different: the chute was improperly installed. Which reminds us of a flight of four F-105s a few years ago. They landed at a base away from home and had their drag chutes repacked and reinstalled there. On returning to home base, in inclement weather, all four had drag chute failures, and two of them wound up in accidents.

Sometimes when a drag chute system fails it culminates a series of problems and, as in the following case, it lets the pilot down when he really needs the chute at a critical moment. With utility hydraulic system failure, the F-100 pilot declared an emergency, lowered the gear and flaps with the emergency system, and landed. When he went for the chute it jettisoned, and he found that his brakes were ineffective, except for directional control. He got the hook down and took the barrier at 118 knots. Hydraulic system failure was due to a ruptured line. The drag chute failed because someone improperly adjusted the retaining jaws.

One more case, another F-100. Shortly after takeoff the crew heard a thump but couldn't determine what caused it. They found out when they landed and the chute did not deploy. It had fallen out in flight. Another case of improper installation.

Nothing is to be gained by adding to this list; they all read about the same: improper installation, linkage out of adjustment, etc. The problem is really the human element. If the linkage is properly adjusted and the chute is installed correctly, then it will work when the pilot needs it. If the job is botched, then there's a good chance the system won't perform as advertised.

If your job includes working with drag chutes, put yourself in the aircrew's place. Imagine how angry you'd be if a mechanic fouled up the brakes on your car and you couldn't stop when you really needed to.

Pilots can take out a bit of insurance by being familiar with the drag chute system on their airplane and inspecting the installation when possible. ★

new method of predicting runway stopping distances offers exciting possibilities



combat traction

Maj David L. Elliott
Directorate of Aerospace Safety
and
Capt Jim Martin
AFSC Test Division
WPAFB, Ohio

WE'RE ALL ACCUSTOMED to seeing the Base Ops vehicle driving down the runway at 30 mph and practicing stopping when the runway is wet. Soon you may see this same vehicle speeding down the runway at 60 mph and practicing stops.

If you take a closer look you'll see some differences that will raise some questions. For example, one front and one rear wheel will have a slick treaded tire. You will see some extra switches, caution lights, and warning placards on the dash. It may even have a roll bar.

It's all a part of a new method to predict the relative slickness of a runway, and unlike the present RCR system, it works—under all conditions, on all runway surfaces.

The new method of predicting runway slickness grew out of a world-wide Pavement Grooving and Traction Studies Conference in 1968 at the NASA Langley Research Facility. Many theories were presented on the causes of pavement slipperiness and how to control the contributing parameters. But they were just theories that required testing.

For example, further research into a vehicle that could predict stopping distances for aircrews was based on a study conducted by NASA at Wallops Island. It was found that a direct relationship existed in stopping distances for three separate vehicles the F-4 Phantom, the Convair 990 and a NASA Plymouth station wagon with special diagonal braking. This diagonal braking vehicle consisted of one unbraked front tire for steering and one for braking, one unbraked rear tire for directional stability and one for braking.

Consequently, the Conference recommended a joint USAF/NASA test to determine if a diagonal braking vehicle could accurately predict stopping distance ratios for wet runways or runways covered with slush snow or ice that would be applicable to all aircraft. There were other



Survey by joint NASA-USAF team equipped with diagonal braking Ford and specially-instrumented USAF C-141 surveyed runways throughout U. S. Preliminary results point toward development of a system which will greatly increase accuracy of wet runway stopping distance predictions for aircraft on any runway surface.

recommendations, perhaps most important of which was to evaluate existing runways to include surface treatments such as grooving, porous asphalt, various surface textures and the size of pavement aggregates. NASA and USAF got a temporary marriage permit and gave birth to Project *Combat Traction*.

USAF furnished a C-141 with crew and a "Combat Traction" project officer. NASA furnished a Ford 500 XL, Walter B. Horne, and some engineers. The C-141 was instrumented with stopping distance measuring gear, multi-directional accelerometers, yaw indicators, and a calibrated speedometer that worked from the nose wheel. Ice check lights were wired to come on when the brakes were applied. White Xs were painted on the wheels so a skid was easy to detect by ground observers.

The Ford was instrumented with a stopping distance measuring device, diagonal braking, a calibrated speedometer, a "G" recording device, and black Xs were painted on the wheels. Everything was air transportable, even the engineers.

In selecting runways, the team tried almost every conceivable surface treatment for comparative analysis. It had to be proven that a true stopping distance ratio existed between the 500 XL, the C-141 and the previous test conducted with the F-4, the 990 and the Plymouth. If this stopping distance ratio was valid, then it could be assumed that a comparative analysis could be accomplished for different runways.

The laboratory was the US, Canada, and Europe. The team visited 31 airfields in the wet runway test to evaluate concrete runways (grooved and ungrooved) and asphalt surfaces (slurry seals, bituminous, grooved and porous). Snow-covered runways, icy runways, and wet icy runways were evaluated during Phase II.

The wet runway test was conducted first. Summertime being what it is, the snow and ice phase was delayed.

The wet runway data was largely obtained by artificial soaking or wetting of the runway. This was done in several different ways: Water trucks, fire trucks, road construction water trailers and in a couple of cases, Mother Nature.

SO THAT THERE WOULD ALWAYS BE a constant base line for the data, the C-141 landed first on a dry runway. The airplane slowed to 100 kts using the calibrated speedometer. Maximum braking was applied with antiskid and held until the speedometer read 15 kts. The C-141 was not brought to a full stop because at 15 kts the antiskid cuts out and a different stopping condition would exist. It's not a true distance for stopping the aircraft, but it is a stopping distance covering a specific parameter that provided a constant base for comparison and was the basis for the wet to dry ratio.

The Ford then made a dry stopping distance run from 60 mph to a full stop. The left front and right rear wheels were locked until the car was stopped. The relative dry stopping distances for the C-141 and the Ford were, for all practical purposes, constant, regardless of the runway or runway surface treatment.

The next step was to water soak the runway by all means possible. The C-141 was airborne, waiting,

combat traction CONTINUED

and the Ford at the pit, engine running. When the proper depth was obtained and the runway cleared, the Starlifter pilot made his approach and landing—spoilers—at 100 mph MAX brakes—release at 15 mph. When the runway was clear the Ford took the active to conduct his run—60 mph—brakes. Stopping distances, Gs and speeds were recorded on a graph.

At each base the RCR was taken with the Base Operations vehicle in accordance with AFR 60-13 and TO 33-1-23 on both wet and dry runways to obtain data for comparison. Thirty-one airfields later, the C-141 went in for a periodic inspection and the Combat Traction team started reducing the data to intelligible digits and making plans for the snow and ice test.

SNOW AND ICE conditions were available in December and the airplane was available in late January. The weather held and the test began at K. I. Sawyer on a runway covered with packed snow. Then at Loring on glazed ice and at NAS Glenview on wet glazed ice, then Alaska—Northern US or wherever the runways could pass the rigid physical.

In one case the runway was so slick that only a taxi type check was made. The snow and ice test was conducted by first off-loading the Ford, conducting a run and notifying the aircrew of the stopping distance ratio. This worked exceedingly well. The predictions were very accurate. At Loring AFB, for example, the Ford predicted a stopping distance ratio of 3.4 to 1. When the airplane figures were compared, while the team was enroute to the next blizzard, they reflected an exciting identical 3.4 to 1 stopping distance ratio.

On a secondary runway at one base, when the RCR was recorded at 1, the stopping distance ratio (icy to dry) was 5.0 to 1 or infinity, whichever comes first. Aircraft maneuverability precluded landing on this runway. Nose wheel steering was of no use and braking was nil. The maneuvering technique found to be most effective for the C-141 was first to taxi very slowly—less than five knots. When a stop became necessary, idle reverse thrust was sufficient to bring the aircraft to a complete stop in less than 100 feet.

Turning was a bit more involved. The optimum technique was found to be to first stop the aircraft, then place the two engines on the inside of the turn in reverse. Then by advancing the two engines on the outside of the turn together with increasing reverse on the two inside engines, the aircraft would pivot in the desired direction. At first there was a tendency to pivot past the intended direction, so it was decided to make the pivot in small increments, maintaining good control at all times. (The surface was so slippery that it was impossible to load the Ford aboard the C-141 because of the complete loss of traction.)

The test was completed in late February. The data are voluminous and will require months to reduce completely, but so far the indications are that some new approaches to the old problem are on the horizon. The diagonal braking vehicle accurately predicted the stopping distance ratio of the airplane within ten per cent of the actual stopping distance under all conditions; whereas the James Braking Decelerometer was found to be completely unusable for predicting accurate stopping distances on wet runways. Recalling one test in particular, RCR readings were averaged to 17 which predicted a 300 foot increase in stopping distance for the C-141. The actual increase in stopping distance was 2500 feet or a wet to dry ratio of almost 3 to 1.

Most significant is the fact that our really fine looking concrete runways have average stopping distance ratios, wet to dry, of 2 to 1 with some as high as almost 3 to 1. This, incidentally, is when water depth is too shallow to cause dynamic hydroplaning.

It was found that wet concrete runways are generally slicker than wet asphalt runways. But the test also showed that two runway surface treatments could create a true wet to dry 1 to 1 stopping distance ratio. One is an asphalt treatment, the other works beautifully on concrete (porous asphalt for asphalt runways and the one-fourth inch

leep by one-fourth inch wide with ne-inch spacing groove for con-rete surfaces).

THE TESTS established that the RCR system is fairly accurate for now and ice conditions. This is be-ause the coefficient of friction re-nains constant with speed on ice or now covered surfaces. Therefore, n RCR reading taken at slow speed rovides an accurate basis for pre-icting braking action at any speed.

Air Force Systems Command is ready designing a modification to rovide a diagonal braking vehicle r Air Force use.

Until the data are reduced, plot-d, verified and approved, we've t to live with what we've got. hen the water depth/touchdown/ eed/tire pressure combination is nducive to dynamic hydroplaning, u will have to treat the landing as emergency.

When the runway is wet, use an CR of 9. That sounds like overkill t some runways have been tested at have a slickness equal to a stop-ng distance ratio of almost 3 to 1 t to dry—*that's an RCR of 9.* ★



alert

Useful tips from UEIs

Observations noted during Unit Effectiveness Inspections

Transient aircraft with forward firing ordance was parked facing a hangar and fire station, presenting an explosives safety hazard. Aircraft were parked by TA without notifying the fire department, MMS or safety.

An MHU-2 trailer **loaded with AIM-4 missiles** was left unattended on the flightline with the engine running. Neither tractor nor trailer was chocked.

A simulated exercise demonstrated that crash rescue and LBR firemen were **unsatisfactory in their emergency procedures** for evacuating incapacitated pilots from a fighter aircraft.

Inadequate maintenance preflight supervision. Aircraft tire pressures were being set 20 psi below TO specs because personnel had not reviewed six-months-old TO change.

There were no formally trained aircraft arresting systems maintenance personnel at Base X. (ATC has a formal barrier maintenance course at Sheppard AFB and a mobile training team.)

In a fighter wing **25 per cent of the IPs tested** missed radio out procedures and 18 per cent missed the question on low level navigation weather minimums.

Instrument shop benches were congested with parts and tools; **floors and test equipment were dirty.** Rubber mats were not available at benches where high voltage was present, and there was no exhaust system installed in the spray painting area.

Driver training and qualification programs were inadequate. **Drivers generally lacked competence** in basic techniques of vehicle operation: lugging and grinding gears, riding clutches, jack rabbit starts. Furthermore, they were unaware of the hazards of carbon monoxide and the safeguards against its effects.

Organization did not maintain record of ALSAFECOM messages and they could not be found **in the flying units.** Routine handling of one message delayed inspection of ejection seats 48 hours. ★

the books tell how but they don't spell out

the why of maintenance procedures

Lt Col Peter J. Pearson, Directorate of Aerospace Safety

Factual determination of the causes of accidents and incidents is vital to mission accomplishment and a successful accident prevention program. Therefore, highly qualified investigators search out all factors that caused or could possibly have contributed to the mishap. Only after careful analyses and study is the primary cause factor determined and all contributing causes listed.

THE COMPARATIVELY FEW AIRCRAFT accidents (a mere four to five per cent) that have been attributed to maintenance error during the past few years is a tribute to our maintainers. Their dedication in the face of long hours, exposure to the elements, hard and grueling work, personnel shortages, skill shortages and increased operational commitments is unquestioned. The maintenance man is a unique type, proud of the fact that his is one of the world's most difficult and demanding professions, while patiently understanding that public adulation and praise have been the traditional prize of the heroes who operate the machines he maintains and cherishes.

The maintainers' profession, however, continues to be racked by many disturbing factors that tend to degrade its inherent professional image. Not the least of these factors are emergency combat situations and attendant personnel procurement and training problems. So, an increase in accidents with maintenance-induced contributing facto



s no surprise. In 1968 and 1969, naintenance error was determined as primary or contributing in 12 per ent of the accidents. True, as stated efore, only a relatively few have been considered primary; but the act remains that the accidents would not have happened in many ases, had the maintenance-induced ontributing cause factor not been resent.

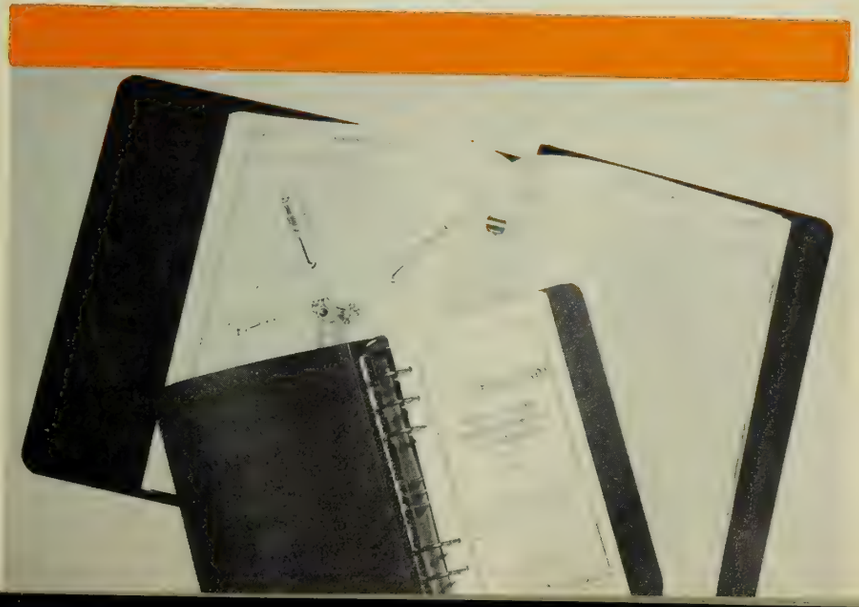
This is not to say that these mainenance mistakes were the result of ntentional negligence or carelessess, since no right-minded ground rew would knowingly dispatch an nsafe aircraft. Such errors, however, do result from haste, preoccuation, lack of coordination, or misken reliance on "improved" methds. Mission pressure and the laudble desire to fulfill the requirements esults in bolts not being installed r torqued, panels not secured, or uns not dearmed.

When the problems of work or ome weigh heavily upon a man, oncentration on the job often suffrs and it is entirely possible that e will omit a cotter pin or miss a icker of stray voltage. Occasionly, shift changes occur at critical oints in maintenance actions, and adequate crew communication reults in a flight control remaining sconnected, spray bars untorqued, improper fuel service rendered.

The conscientious, clever, and reourceful mechanic is sometimes his vn nemesis. His attempts to reduce anhour requirements often lead to rocedures which do not follow those stipulated in technical directives; generally, with an unrecognized loss in reliability or quality. Breakout and deflection force checks substituted for visual inspection of flight control cable routing will not always detect a cable misrouted under a bracket.

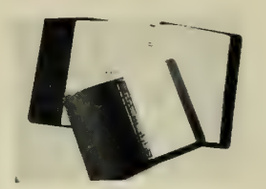
The well-worn subject of adherence to checklists has been discussed to the point of exhaustion with, hopefully, beneficial results. Last year, an A-37 was scheduled to be ferried to a West Coast air base, but its nose gear retracted during the start. Investigators determined that the gear handle was in the UP position. Pilot error was assessed as the primary cause, but maintenance was a contributing factor. Had the pilot followed the checklist properly, the accident would not have occurred. However, it would be just as appropriate to apply the same reasoning to the maintenance crew's actions. Had they *not* left the gear handle up, or had they checked to see that it was down on the preflight, the accident would not have occurred.

Here's another "whodunit" but the aircrew wasn't around to rebut the findings. When their many-motored monster reached takeoff speed, the nose pitched abruptly up and a tragic crash resulted. Maintenance had been performed on the



CONTINUED

the "why" of maintenance procedures



aircraft, and a defueled fuel tank had not been refilled. Failing to detect the condition, the aircrew did not set correct trim. Pilot factor was, of course, assessed as the primary cause; but, had maintenance made the non-standard fuel load distribution known to the right people, or if the fuel load had been properly configured, the accident would not have occurred.

Aircraft configuration changes present ready-made pitfalls to the complacent, and routine drop-tank removals and installations are probably the biggest traps. Sometimes, because of their desire to meet mission requirements, or their lack of understanding of the necessity to comply strictly to tech order procedures, maintenance crews make grievous errors. High on the list of such errors are installing tanks without benefit of torque wrenches and using unauthorized release and lock checks. Inadequate inspections of the release mechanisms are common. Like the old roof that leaks only when it rains, a release mechanism is not needed when the tank is off—and the crew is usually in a hurry to get it installed, so they don't take the time to check it. The two following accidents, wherein maintenance error was determined, tragically illustrate the point.

One crash occurred following a formation takeoff. Apparently, Lead's engine failed immediately after liftoff. One tank separated, probably when the pilot tried to jettison both tanks. The result was a serious imbalance at a critical phase of flight. Had the tanks released simultaneously, the chances were good that the fatal crash would not have occurred.

In the second instance, a heavily loaded fighter blew a tire on rotation, and the pilot properly elected to continue the takeoff. But when stores jettison was initiated, one 450-gallon drop tank remained—with predictable consequences. Had a clean jettison occurred, it is unlikely that the accident would have occurred.

Another fuel foul-up involved a fighter. A defective fuel quantity indicator had been properly recorded in the aircraft forms, but the bird was released for flight. The aircraft had not been completely serviced and, unfortunately, the pilot's preflight inspection was cursory. The primary cause of the subsequent crash was assessed as pilot error; but, again, the aircraft should not have been released for flight with an inaccurate fuel gage or an improper fuel load.



Failure of drag chutes to deploy have resulted in some altogether unnecessary catastrophes. Generally speaking, these failures have been rarely assessed as primary accident cause factors; but, they have certainly been responsible for compounding pilots' difficulties after their troubles had commenced. In one such instance, one of our fighters was returning heavy and landing from a GCA. The drag chute failed to deploy, the tail hook failed to catch the barrier and all gears were sheared when the aircraft ran off the runway. Naturally, the pilot picked up the tab; but, he'd have been in the clear if the drag chute had been properly installed.

If technical instructions were to contain complete information as to **why** an action must be completed as outlined, the size of the publication would be prohibitive. Therefore, until we discover some better means of instilling a knowledge of the "why" of maintenance procedures, we will have to rely on the old requirement to adhere without deviation to the published procedures and checklists. ★

Toots

is interested in your problems. She spends her time researching questions about Tech Orders and directives. Write her c/o Editor (AFIAS-E1), Dep IG for Insp & Safety, Norton AFB CA 92409



Dear Toots

A checklist step that requires checking fuel container markings should solve the aircraft mis-servicing problem in all units.

TSgt R. G. Rawson
Nellis AFB, Nev

Dear R. G.

It might, were it not for those types who fill in the Block 15 and 16 entries merely as a matter of form; they'd probably do the same with the checklist. A forthcoming revision of AFM 127-101 will require a POL checklist, and that flight line supers identify aircraft and type of fuel when ordering. Anyone who thinks an extra step in the servicing checklist might help can submit an AFTO Form 22.

Toots

Dear Toots

After a heated argument recently, I consulted TO 00-20-5 to refresh my memory concerning the correct use of the AFTO Form 781A's "Discrepancy" and "Corrective Action" blocks.

The argument arose over which line should the documentation begin on—the first vacant line or second one. The TO has a sample application showing both the discrepancy and corrective action beginning on the second line but does not give an explanation for this procedure. The only explanation the TO gives for using the first vacant line is in the "Discrepancy" block where the pilot enters on which flight the discrepancy had taken place.

I was taught in Tech School to use the first vacant line on both the "Corrective Action" and the "Discrepancy" blocks with the exception of the pilot's entry of the flight number in the "Discrepancy" block. Since then I have seen both procedures used on a single 781A. Please help me settle this argument and keep forms uniform.

A1C John D. Duvall

Dear John

You're right! The samples in TO 00-20-5 are confusing! I got in touch with the people at the AMA that are responsible for this tech order, and would you believe? The portion of 00-20-5 that you asked about is under revision right now. So the nice men there are going to take a good look at the illustrations for the 781A. In the meantime, they say you are supposed to use the first line in the discrepancy and corrective action blocks. Of course, local directives may go into more detail on how the blocks are to be used, as long as they don't violate TO 00-20-5.

And I'm sure you know where to find the procedure for correcting errors you may find in any TO. (It's in TO 00-5-1, for all you other guys who couldn't think of it.)

I'm real proud of your interest in neatness and uniformity of the forms you work with.

Toots

THE I.P.I.S. APPROACH

By the USAF Instrument Pilot Instructor School, (ATC) Randolph AFB, Texas

DECISION HEIGHT

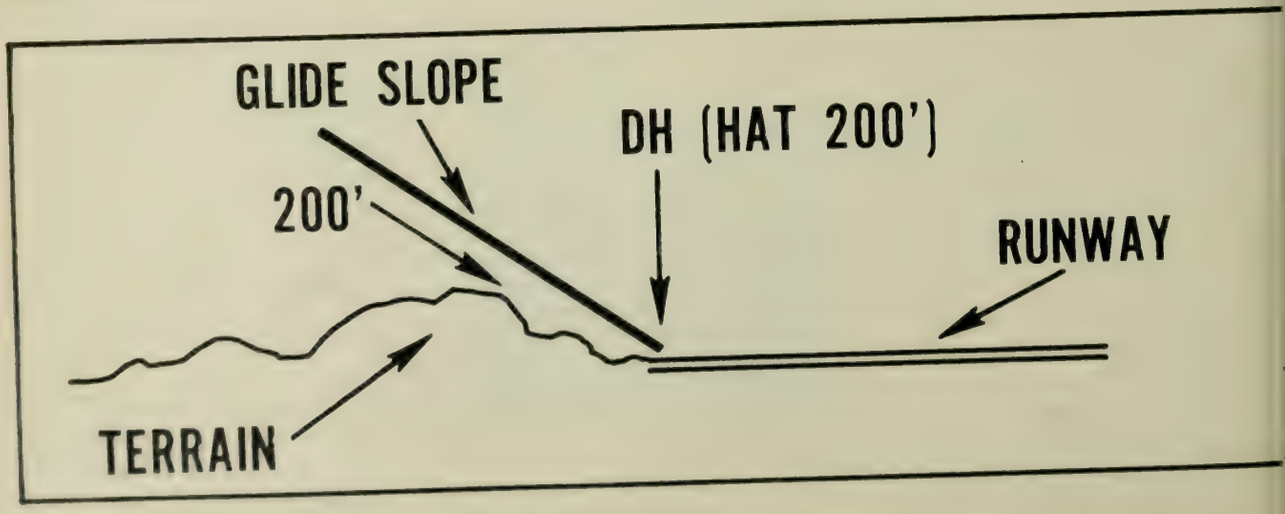
Q How far below decision height (DH) is considered unsatisfactory on an instrument check flight?

A There is no specific tolerance that can be established for descent below a DH. The DH is a point on the precision glide path (ILS or PAR) where the pilot makes his decision to land or execute a missed approach and is not intended to be a minimum altitude below which the aircraft will not descend. If the pilot decides to execute a missed approach at DH, it is only logical that the aircraft will go lower than DH while transitioning to a climb. If the performance of certain aircraft is such that a specific DH will not permit a safe execution of a missed approach, then the DH should be adjusted accordingly. This is normally done at the Major Command level.

During an instrument check flight the emphasis should be placed on the pilot's adherence to proper aircraft procedures when executing a missed approach at DH and not how far below DH the aircraft goes.

Q Can I use a radar altimeter to determine DH on an ILS approach?

A No. As you know, the radar altimeter measures the altitude directly below the aircraft. Assuming the HAT for an ILS is 200′ it is possible that you would reach 200′ on the radar altimeter (depending on terrain) prior to reaching the DH point. The diagram below illustrates this.



ILS

Q Why is glide path interception considered the final approach fix on an ILS?

A Reference JAFM 55-9 (TERPS), par 930. This is no longer true. The new TERPs states that: "The final approach segment shall begin at the point where the glide slope is intercepted, and descent to the authorized decision height (DH) begins. Where possible, this point shall be coincidental with a *designated FAF* (outer marker, compass locator, DME, radar, or other approved compatible radio fix.)" You as a jock are really not too interested in where the final approach *segment* begins, but now the FAF will be the OM or a substitute fix in most cases. TERPs further states: "At locations where it is not possible for the point of glide slope interception to coincide with a designated FAF, the point of glide slope interception shall be located PRIOR to the FAF. Where a designated FAF cannot be provided, specific authorization by the approving authority is required."

FINAL APPROACH CONFIGURATION

Q The IPIS teaches that final approach configuration and airspeed should be established *prior* to FAF. Why prior to?

A The philosophy behind this is that nonprecision approaches are usually based on timing from the FAF to the missed approach point. If you are not at a constant airspeed from the FAF on in, your timing will be inaccurate and a missed approach more likely.

VORTAC APPROACHES

Q What navigational equipment is required to fly a "VORTAC" approach?

A JAFM 55-9 (TERPs), par 500, describes a VORTAC procedure as follows: "When both the VOR and TACAN azimuth elements of a VORTAC station will support it, a single procedure, identified as a VORTAC procedure, may be published. Such a procedure may be flown using either a VOR/DME or TACAN airborne receiver." The connotation is that DME is required. Most approaches published as a "VORTAC" procedure will require DME fixing somewhere in the procedure, which would preclude flying it with only a VOR receiver. However, some do not, and some even show a timing table for the final approach. Extreme caution should be exercised and a very thorough study of the procedure should be accomplished if a VORTAC approach is to be attempted with only a VOR receiver. Don't forget to check the missed approach instructions, too! !

POINTS TO PONDER

• On an ILS the decision height (DH) is based on altimeter reference only, while PAR DH is on altimeter reference or determination by the controller, whichever occurs first. Can PAR decision height (DH) procedures be changed to coincide with ILS and eliminate the determination and transmission by the controller entirely?

One of the problems in making an across-the-board change in this procedure is the type of equipment we have in our AF aircraft. If a Major Command has aircraft with more sophisticated equipment and feels the pilot only should make this decision, a command directive would seem to be in order. The procedures in AFM 51-37 are intended to cover the majority of our equipment and pilots and are not meant to be restrictive where equipment or judgment allows a safer, more precise flight using other procedures.

• Do you realize that some landing minima may change because of new TERPs criteria? Check your terminal charts and IFR Supplement.

• Are you aware of the nonstandard VASI at some Air Training Command bases? ?

Check the IFR Supplement! ! ★

CORRECTION

In the May 1970 IPIS APPROACH article, paragraph 2 of the answer under Holding Patterns, lines 5 through 7 should read: If the holding pattern is *charted, the controller may say only* "cleared to (fix), hold (direction)." (Changed wording in italics)—ED.


MAJOR
REX RILEY
SPECIAL INVESTIGATOR for AIRCRAFT ACCIDENTS
OFFICE FLYING SAFETY
HELLO JANE!... WHAT'S MY FAVORITE SECRETARY DOING?
PRIMPING... AS USUAL!
MAJOR REX RILEY RETURNS TO HIS OFFICE... WITH ANOTHER FATAL ACCIDENT REPORT...
IT LOOKS PRETTY MESSY UP AHEAD... BETTER CALL A RADIO AND CHANGE TO AN IFR CLEARANCE AND ANY ALTITUDE AVAILABLE.
CLEARED CFR TO HIS DESTINATION, THIS PILOT SAW BAD WEATHER AHEAD AND A LOW CEILING...
THE CEILING IS LOW AND VISIBILITY POOR BUT I'LL TRY REMAINING CONTACT UNDER THIS STUFF UNTIL RADIO APPROVES MY INSTRUMENT ALTITUDE.
INSTEAD OF HOLDING IN CONTACT WEATHER, UNTIL HE HAD BEEN CLEARED BY
PODUNK RADIO FROM A-26 REQUESTING IFR ALTITUDE... HOW DO YOU RECEIVE ME?... OVER.
A-26 FROM PODUNK RADIO... RECEIVE YOU LOUD AND CLEAR. STAND BY FOR APPROVAL OF YOUR IFR PLAN ...OVER!
THE RADIO STATION TO CLIMB TO AN ALTITUDE ON INSTRUMENTS, HE ATTEMPTED
FLIGHT PLAN (PILOT COMPLETES) R
3670
D
1
CFR
IFR
ALT. C7
ROUTE A
TO M
AIRPORT OF FIRST INTENDED LAN
Lowbrook
TIME OFF TIME
I WISH RADIO WOULD HURRY AND APPROVE MY IFR ALTITUDE... THIS STUFF IS REALLY ON THE DECK!
TO STAY CONTACT UNDER THE LOW CEILING.
DARTING IN AND OUT OF THE CLOUDS AT TREETOP LEVEL IN THE RAIN, HE SAW A
CRASH
RISE IN THE TERRAIN BUT TOO LATE TO PREVENT THE A-26 PLANE FROM CRASHING!
I FEEL SO SORRY FOR THOSE FIVE POOR BOYS, REX!
YES, JANE, IF THE PILOT HAD ONLY REMAINED IN THE CLEA UNTIL HE HAD RECEIVED HIS IFR CLEARANCE, HE AND HIS CREW WOULD BE ALIVE TODAY!
CAPT. DICK GRANT
Field Office Of The Inspector Langley

REX RILEY'S
CROSS COUNTRY NOTES

On the opposite page is the first Rex Riley poster of a 23-year-long series. Created by Captain Richard A. Grant in 1947 at Langley Field, Va., the Rex posters have done great things for the Air Force flight safety program and have remained practically unchanged in style from Dick Grant's original idea. In 1949 Master Sergeant Steve Hotch picked up the assignment, retaining the cartoon presentation of an aircraft accident brief—and the shapely secretary's legs. The latest Rex artist, T/Sgt Dave Rider, is now assigned to AF Audio-Visual Service at Norton AFB.

LOOKING FOR TROUBLE

There's more than one way to get in trouble. One is to accept the ATC clearance without thinking about the consequences.

Recently a T-37 IP and his student, approaching destination, were cleared down to FL 180 with an Expect Approach Clearance time which would require them to hold at the VOR. Two or three minutes from the station, in stratus, they began picking up structural ice. And they remained in clouds for the nine minutes they held before starting penetration. That's when the ice warning light came on briefly. The wings of their Tweet had three-fourths inch of ice, the windscreen a little less. At 17,000 feet they were in the clear and by 8000 the ice had sublimated. Wings, windscreen and the right engine intake appeared clear to the IP.

On the go from a low approach, the right engine flamed out. Then the student saw ice on the left intake. They restarted the engine and landed. But engine troops could find nothing wrong. Apparently ice inside the intake had been ingested, causing the flameout. Fortunately, they had two engines.

And the pilot could have asked for a change of altitude when he was holding! ★



Lt Col Richard A. Grant, as a Captain in 1947, had flown as an unconventional warfare pilot in the South Pacific and European theaters when he used his newspaper cartoonist experience and created Major Rex Riley. After leaving Rex in 1949, he earned master jump wings, served four tours with Army Special Forces and one with the Navy Seals, won Thai and Korean Guerrilla jump wings. He completed a colorful and rewarding career 1 April when he retired at Mather AFB.



REX RILEY

Transient Services Awara

LORING AFB	Limestone, Me.
McCLELLAN AFB	Sacramento, Calif.
MAXWELL AFB	Montgomery, Ala.
HAMILTON AFB	Ignacio, Calif.
CHANUTE AFB	Rantoul, Ill.
SCOTT AFB	Belleville, Ill.
RAMEY AFB	Puerto Rico
McCHORD AFB	Tacoma, Wash.
MYRTLE BEACH AFB	Myrtle Beach, S.C.
EGLIN AFB	Valparaiso, Fla.
FORBES AFB	Topeka, Kans.
MATHER AFB	Sacramento, Calif.
LAJES FIELD	Azores
SHEPPARD AFB	Wichita Falls, Tex.
MARCH AFB	Riverside, Calif.
GRISSOM AFB	Peru, Ind.
PERRIN AFB	Sherman, Tex.
CANNON AFB	Clovis, N.M.
HICKAM AFB	Hawaii
LUKE AFB	Phoenix, Ariz.
RANDOLPH AFB	San Antonio, Tex.
ROBINS AFB	Warner Robins, Ga.
TINKER AFB	Oklahoma City, Okla.
WETHERSFIELD AFB	England
HILL AFB	Ogden, Utah
YOKOTA AB	Japan
SEYMOUR JOHNSON AFB	Goldsboro, N.C.
ENGLAND AFB	Alexandria, La.
MISAWA AB	Japan
KADENA AB	Okinawa
ELMENDORF AFB	Alaska
PETERSON FIELD	Colorado Springs, Colo.
RAMSTEIN AB	Germany
SHAW AFB	Sumter, S.C.
WRIGHT-PATTERSON AFB	Dayton, Ohio
LITTLE ROCK AFB	Jacksonville, Ark.
TORREJON AB	Spain
TYNDALL AFB	Panama City, Fla.
OFFUTT AFB	Omaha, Nebr.
ITAZUKE AB	Japan
ANDREWS AFB	Washington, D.C.
McCONNELL AFB	Wichita, Kans.
NORTON AFB	San Bernardino, Calif.
BARKSDALE AFB	Shreveport, La.
HOMESTEAD AFB	Homestead, Fla.

what's MEP?

. . . a new kind of tool for the maintenance man

Willie N. Bowman, WRAMA, Robins AFB, Georgia

A valuable tool for Maintenance Managers at all levels may have escaped your attention. This tool is the Air Force Maintenance Evaluation Program (MEP) the sole purpose of which is to assist you in resolving your maintenance problems. This is accomplished through field evaluation of a wide array of products, processes, equipment, tools, regulatory publications, specifications and ideas.

The program applies to Motor Vehicles, Aerospace Ground Equipment, Corrosion Control, Turbo-jet and Turbo-prop Engines, Avionics, Ground Communications-Electronics-Meteorological Systems and Equipment, and Civil Engineering. The examples below give you a better idea of the scope of the program and what the projects normally entail.

P-10 FIRE TRUCK

The P-10 truck was commercially developed employing commercial standard components and parts. It is a fast action unit employed to transport a rescue team with equipment to combat fires and cut rescue openings in the fuselage of aircraft, while heavier fire fighting equipment is on the way. A one year field evaluation under the MEP indicated the P-10 truck has operational advantages and costs $12,455 less per unit than the older R-2A vehicle. Repair parts will be more readily available for the new truck. Most important, it will provide faster rescue service.





CORROSION PREVENTION (AGE)

Corrosion damage to Aerospace Ground Equipment (AGE) has been recognized as extremely costly to the Air Force. Southeast Asia operations have been particularly affected by this problem. Evaluation of a process involving blast cleaning, a flame-sprayed zinc protective base coating and vinyl finish coating for AGE was conducted to determine if this system could be economically used as a depot processing method. Prior laboratory evaluation of the process had indicated it to be better than the most widely used standard AGE coating system. The evaluation revealed that the cost of coating materials for the flame sprayed zinc process was significantly less than the cost of the standard military coating system (MIL-P-38336 and MIL-C-38412). A projected saving of $200,000 per month for material used at the depot led to immediate implementation of a flame sprayed coating process at SAAMA.

TACAN MODIFICATION

The AN/ARN-21 TACAN navigation system in T-39 aircraft required excessive maintenance manhours due to failure of the Distance Measuring Equipment to lock on station. An MEP project was initiated to evaluate a proposed modification. During field evaluation, additional modifications involving relocation of the aircraft antenna were found necessary. Under some flight conditions, the nose landing gear had interrupted the antenna operation. After modification, the antenna was 96 per cent more effective in overall ground station interrogations. Follow-on action is being taken by the T-39 system manager to prepare a field-level Time Compliance Technical Order providing for similar modification of the T-39A aircraft fleet.

While these examples give you some idea of the types of evaluations performed, the variety extends much further. AFR 66-8 is the charter for the MEP. It explains the scope of the program and tells who does what to cause an evaluation to be made. In general terms, when you recognize a maintenance problem or you wish to have a new idea or concept evaluated, write to the MEP Monitoring Agency through the normal chain of command (Address: WRAMA [WRNEP], Robins AFB, GA, 31093) outlining the problem and nature of evaluation desired. If the improvement came about through the suggestion program, include the suggestion number. The monitoring agency will perform any additional research required and process the request through the complete cycle to finalization of the project.

Each 90 days, the Maintenance Evaluation Program publishes a project status report. This report contains the current status of all projects in the evaluation stage, those for which evaluation has been completed and resulting actions are being taken, plus a resume of the projects completed during the reporting period. If you desire to be placed on distribution for this report, contact the program monitoring activity listed above.

It should be noted that the difference between MEP and the suggestion program is that the MEP is an evaluation in the field, while the suggestion program is more or less a behind-the-desk evaluation.

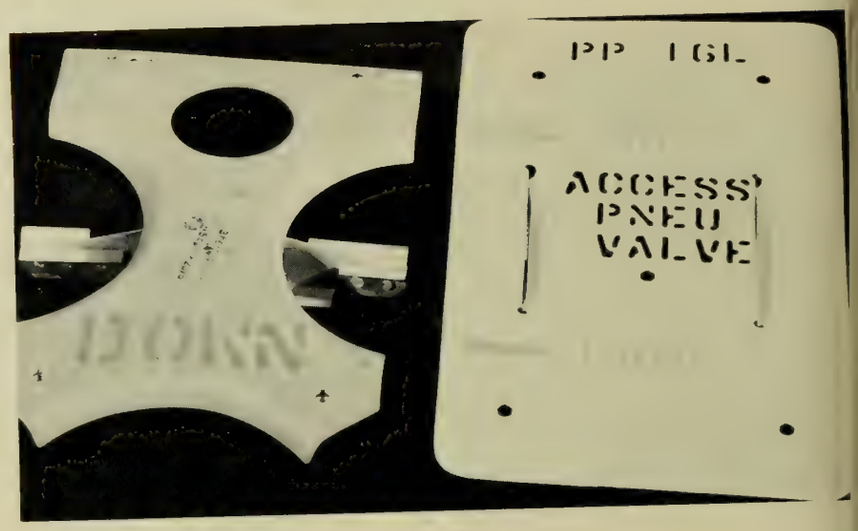
Use the services of the Maintenance Evaluation Program when you need assistance in resolving your maintenance and operations problems. Numerous customers from squadron level through major commands have found the program very useful in keeping their organizations in tune with the times. ★

Tech topics

BRIEFS FOR MAINTENANCE TECHS

C-141 · missing panel

C-141 During postflight inspection a C-141 pylon blowout panel was missing. The flight engineer, when questioned, stated that the panel was in place when he performed his takeoff and climb checklist. Both the blowout door, P.N. 3P61635-115, and the spider assembly, P.N. 3P61634-101, were missing. Further investigation revealed that it is very easy to install the blowout panel upside down and that it is quite difficult to detect. In this upside-down position a one inch space at the base of the spider could allow the spider, panel and all, to slide down and off, providing one of two conditions exists: (1) The bottom two screws that hold the panel to the spider are not tight, (2) if the bottom portion of the panel is bent enough to allow it to overlap the pylon skin.



The photos show an easy way, developed by the 438th Military Airlift Wing, to detect an improperly installed pylon blowout panel. Stencil each panel with the words, UP and FORWARD with arrows pointing in the appropriate direction.

The stenciling, along with the position the louvers are in, will give positive indication of a properly o improperly installed panel.

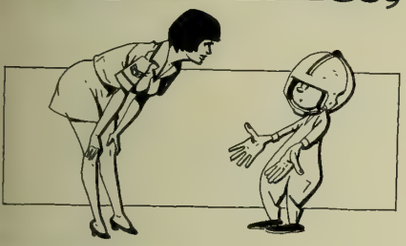
In view of the number of prob lems encountered with this particu lar panel, all personnel, air as we as ground crews, should be espe cially watchful to insure that th pylon blowout panel is properl installed. ★

missing nose wheel

THE LEFT NOSE WHEEL of an F-4 was discovered missing after the aircrew had completed an uneventful landing and taxied into the parking area. The wheel, which had fallen on base, was recovered and, after inspection, was reinstalled. The axle nut, lock screw and keyed spacer, were not recovered. According to the report, the primary cause of the incident was undetermined. Tl most probable cause was Maint nance because the TO gives tv different axle nut torque values, d pending on which of two differe wheels is being installed. This in dent points out the importance following the TO, step by step, un job completion. ★

Tech topics

look ma, no oil!



DURING CLIMB after takeoff a T-41 instructor pilot noted engine RPM falling off. While he pumped the throttle in an attempt to increase RPM, the engine froze. The IP set up a forced landing glide straight ahead; however, high tension power lines caused him to execute a 90 degree right turn. He then saw farm buildings in the proposed rollout area and made another 90 degree right turn. He landed the aircraft in a wheat field without damage.

Investigation revealed there was practically no oil in the engine. When the sump plug was removed less than one pint of oil ran out. The aircraft had just undergone the first 50-hour inspection after engine change. After the crank case was drained it was never refilled, but the aircraft had been returned to the flight line as operationally ready. The instructor pilot states he observed 7.2 to 7.5 quarts on the oil dip stick during his preflight inspection (probably residual oil). He further stated that two separate engine instrument checks prior to takeoff did not reveal any irregularities.

Someone didn't follow through on his job. If you can't be there personally, make an entry in the AFTO 781A. ★

a case for safety wire

THE PILOT OF an O-2 noticed oil, or hydraulic fluid, on the tire when the gear was lowered in preparation for a GCA practice approach. He aborted the approach and climbed to 2500 feet. Then the rear engine oil pressure dropped to zero. The engine was shut down and a landing accomplished without further incident.

Maintenance personnel discovered the quick drain valve plug lying in the engine cowling. The drain plug had not been safetied which allowed the plug to back out and all engine oil to escape. ★

bug-a-boo



WHEN PARTS and assemblies are removed and hydraulic or pneumatic lines are disconnected, caps or plugs provide protection for more reasons than to exclude dust. Some mechanics overlook, for example, the bug bug-a-boo. Bugs look for quiet, dark holes to crawl into. Open lines are ideal to them. Mud daubers may even call them home. One simple capping substitute, like aluminum foil, is insufficient because it does not fit closely; plastic wrap is better. A rubber band is additional security around the plastic wrap. Bugs are also a nuisance in aircraft wing or fuselage cavities. Bugs crawl into these dark areas and die or hibernate. Fumes, in turn, may kill them if they don't die naturally. As the bugs deteriorate, with moisture present, formic acid is commonly formed and severe corrosion results. Care must be taken to assure removal of bugs from the aircraft. Vacuuming provides good results. ★

J. H. Cates, SMAMA (SMNET)
McClellan AFB, CA

Tech topics

CONTINUED

maintenance reel news

THE FOLLOWING NEW USAF films are available through your local base audio-visual library or audio-visual servicing activity. Installations without film service can order from the USAF Central Audio-Visual Library, an Aerospace Audio-Visual Service (MAC) unit, Norton AFB, California 92409.

Requests should contain complete film titles and serial numbers. Because of heavy demand, please give alternate showing dates and films. All films are 16mm with sound.

TF 6132 AVIONIC MAINTENANCE SAFETY. Defines hazards of high voltage equipment and radioactive tubes. Demonstrates use of emergency equipment. Explains dangers of radiation, engine noise, ingestion, and hot gases emitted from aircraft. Demonstrates method of grounding test equipment. 16 Min. Color.

TF 6302 THEY CALLED IT FIREPROOF. The scene of this film is a supposedly fireproof hospital. As the story unfolds, many infractions of fire safety rules are seen. Combustible material is everywhere. A tour of laundry and kitchen facilities shows unhygienic conditions. Sudden fire brings death and damage as a sad conclusion. 21 Min. Color.

TF 6313 F-111A/FB-111A WEAPON SYSTEM—Ground Handling and Servicing. Demonstrates complex handling and servicing procedures for the F-111. Includes parking, installation and removal of safety devices required for static aircraft; placement, correction and removal of ground support equipment; fuel, oil, hydraulic and air checks; refueling and defueling procedures; and danger areas in and around operating engines. 11 Min. Color. ★

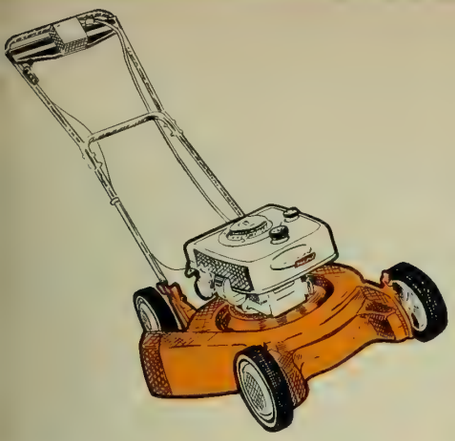
engines will eat anything

ENGINE FOD. Engines will eat dust plugs, but rarely will they survive the ordeal. Take the case of the T-38 being checked on the runup pad. Maintenance was ops checking the Nr 1 engine for an EGT problem. Both engines were being operated at a little over 90 per cent when a loud noise was heard and Nr 2 rolled back. The engine was immediately shut down and checked. It was found that all stages of the compressor section were damaged because the engine tried to swallow the intake plug. Why was the intake plug left in? Because maintenance goofed. Why did maintenance goof? Because they did not religiously follow the checklist before starting engines. They had performed maintenance on Nr 1 engine and were performing an ops check without completing the "Before Engine Start" checklist. Perhaps maintenance was trying to save time, or was it just plain negligence? Follow your checklist and eliminate expensive FOD. ★

non-reversible gages

DURING A B-52 fuel top off, the center wing tank shut off with a gage indication of 24,000 pounds, instead of the required 29,800 pounds. The refueling supervisor noticed that the fuel gages for the forward body and center wing tanks were reversed. He called for instrument shop assistance and continued the refueling. An extra 5000 pounds was believed to have been put into the forward body tank, with intentions of transferring it to the center wing tank after the correct gages were installed. However, prior to arrival of the instrument personnel at the aircraft the flight crew arrived. The pilot had the crew chief dip the tanks. The forward body tank contained 3400 pounds, and the center wing tank contained 33,600 pounds of fuel. This put the C.G. out of limits. When instrument personnel arrived, they reversed and recalibrated the gages. Fuel was transferred to correct the C.G. and the fuel system indicated normally.

Imagine what a catastrophe this incident could have turned into if not corrected in time. Crew chiefs, insist that all work be documented and don't allow anyone to work on your aircraft without the proper work order. ★





GRASS YES... FINGERS NO!

Every year, along with robins and aphids, this season brings the guttural sound of the power mower turning shaggy grass into a carpet-like lawn. And every year there are some fingers, toes and eyes sacrificed to these grass chewing monsters.

Supervisors scratch their heads and try to think up new ways to prevent mower mishaps. And well they should. Last year there were 375 man days reported lost due to mower accidents; the cost of injuries per individual ranged from $52 to $2250.

You may have been mowing the grass for years at home, or possibly on the job, without a nick, so you wonder how people can be stupid enough to get hurt. Well, it's easy. There are basically three ways in which one can get seriously hurt with a power mower. You can be struck by a whirling blade, hit by a rock or other object hurled at you by the blades, or, in the case of the electrical mower, shocked, burned or even electrocuted!

Most injuries are associated with rotary mowers. The whirling blade can chop off fingers and toes quite efficiently, so if you wish to preserve your digits don't let them get in contact with that blade when the mower is running. Another hazard with all mowers is the possibility of an object being picked up and thrown at the operator. The resulting injury can be lethal at worst and painful at best.

Electrically powered mowers present the same hazards, in addition to the possibility of shock from worn cords and operation on wet grass.

Here are a few ideas that will prevent injuries and help you get the most work out of your power mower, whether in your own back yard or on the job.

- Inspect the blade of the rotary mower and make sure that it is sharp and not cracked. If it is cracked it should be replaced. A plastic-tipped blade may be the answer. Air Training Command evaluated one type that sells for $7.95. Their test indicated that plastic-tipped blades are most suitable for the type of mower you would use at home.

The best thing about this blade is its built-in safety feature. During the ATC test a leather boot was placed under a power mower with about an inch of the boot toe within the arc of the blade. In one and one-half seconds the metal blade slashed open the boot. Then a boot was exposed to the plastic-tipped blade for eight seconds. Result: the boot was scuffed but not penetrated.

- Keep the mower clean. It will work better and will last longer because cleaning will retard corrosion and there will be less chance of clogging.
- Don't do any work on the mower with the engine running. With an electric mower be sure the power cord is disconnected.
- Don't fuel the machine while the engine is hot. Let it cool for a few minutes to prevent a flash fire, then fuel it using a funnel.
- Police the area prior to mowing. This way you can remove the bigger rocks, metal bits and pieces and sticks that will jam the mower or be thrown back at you. Also, you can prevent damage to the blades in this way and save a repair job on the sprinkler system by making sure that pop-ups are not stuck in the up position.
- Wear appropriate foot gear. On the job, AFM 127-101, para 0401.6 (3) 1 states that personnel operating power mowers will wear safety toed shoes. At home, we recommend these if you have them. Otherwise, wear boots or heavy high topped shoes. (If you operate a power edger wear goggles with safety glass.)
- Don't allow children to operate power mowers of any kind.
- If you must work on a slope, don't try to pull the mower uphill—work horizontally instead of up and down. Then if it gets away from you, you won't have that churning monster charging in your direction.
- With an electric mower or edger, be sure the cord and plug are in good condition and that the ground lead is connected. Don't operate on wet grass; don't run over the cord. ★

Sympathy or ACTION?

James H. Smith
SAAMA, Kelly AFB Texas

"That widget is in the warehouse, and it is colder than a well-digger's hip pocket here in Alaska. Why do you need that number? You ought to know who sold you those widgets. We got used to one report system, and then you changed it completely. How about some sympathy for us in the field?"

From his tone of voice, the sergeant would like to rub my nose against the widget. That might not be a bad idea; at least I could read the numbers on it.

I am in San Antonio. It was February and the temperature was 31 degrees. I have the warmest sympathy for any troops north of Amarillo. But sympathy won't keep them from drawing a defective widget, installing it in a cold-soaked airplane, only to find that it won't work and they have the whole job to do over. Action to get good widgets in stock will do more for the troops than all my sympathy.

If a cold climate doesn't fit your station, substitute "Arizona," "hotter than blazes," and "July." We'll have a similar conversation with you this summer, unless the stock of widgets has been fixed.

The records do show where we have bought widgets, from several different low bidders. They have been overhauled by other low bidders and by two Specialized Repair Activities. To correct the manufacturing or repair procedures we need to know who goofed. To purge bad widgets from stock, we have to identify them by source. We must have the numbers!

You are the expert on your defective item. We haven't seen it. We don't know exactly what went wrong unless you tell us, or send a photograph to show us. We don't have any facts you don't give us.

Your reports don't always give the facts we need.

Here is one example on my desk:

(1) The Federal Stock Number does not agree with the part number or the nomenclature.

(2) The part number does not belong to the manufacturer shown as the item source.

(3) The item identified by nomenclature and in the narrative is not prime at this AMA; the report is misrouted.

Taking action with all the contractors that might be involved, armed with this report, would be like hunting one elephant by attacking the herd, armed with wet ammunition.

Some boners are more amusing than confusing. Even so, how do you convince a contractor that the troops followed the tech order in using his complicated equipment, when the officer or NCOIC obviously did not follow TO 00-35D-54 to fill in the blanks on a simple one-page report form?

Ninety per cent of the reports we receive have obvious errors or omissions. The average is about three boners per form. There are errors in distribution on about one-fourth to one-third of the reports.

Before you laugh too loud, grab your last Quality Unsatisfactory Materiel Reports and score them carefully against the attached checklist. Use a CURRENT copy of TO 00-35D-54 and TO 00-25-115.

THE QUALITY DEFICIENCY REPORT FORM, ITS CONTENTS, AND ITS DISTRIBUTION, CHANGED COMPLETELY ON 1 JANUARY 1970.

Here are a couple of tips to help you route the new Quality Unsatisfactory Materiel Reports (QUMRs, DD Form 1686):

(1) There are only six action agencies for QUMRs: SAAMA (SANMQ), WRAMA (WRNMQ), SMAMA (SMNMQ), OCAMA (OCNMQ), OOAMA (OONMQ), and Hq AFLC (SGMEO) for certain items in Federal Supply Group 59.

(2) To identify a management code to the responsible AMA, use Atch 2, Chap 2, Vol I, Part Two, AFM 67-1, borrowed from your supply people.

Will the defect show in a photograph? If so, were photographs submitted? The exhibit will be shipped to the item source. Even though we now write the final reply, we don't see many exhibits here at the AMA. Photographs let us see exactly what went wrong, too.

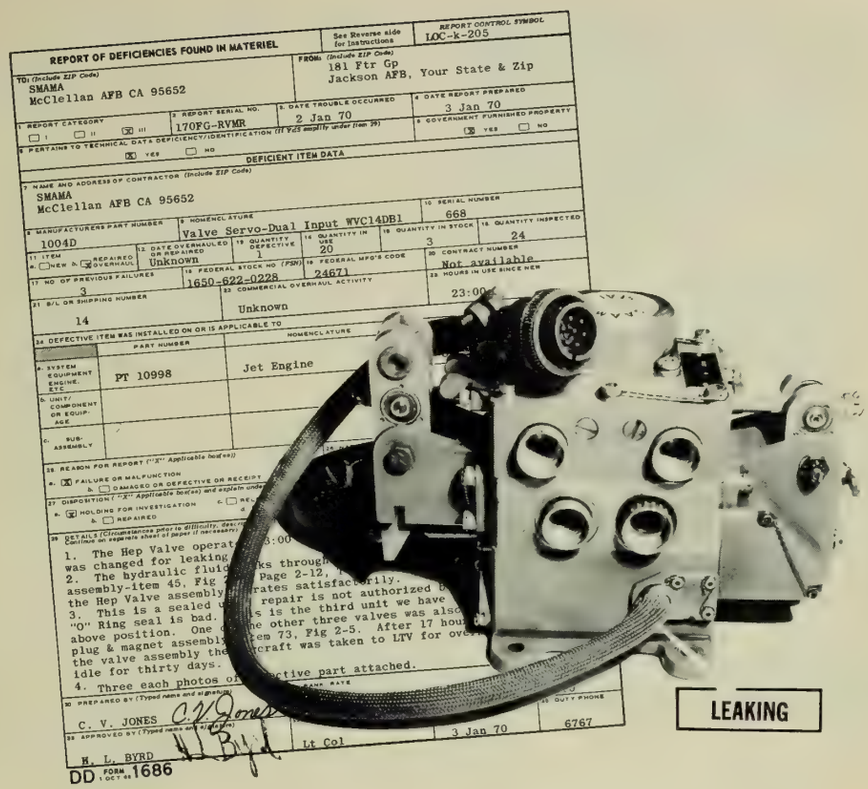
Contractors sometimes accept a well-written report, backed up by good photographs, without asking

for the exhibit. Good photography can pay for itself in shipping charges alone.

Were exhibits offered? The contractor thought his item was good. We have to show him it wasn't, particularly if we want him to repair or replace it at no charge. Having the solid hardware available to support the QUMR and the photographs will put the Air Force in a much better bargaining position, even when we don't have to actually ship the exhibit.

Several units consistently submit accurate, complete reports that comply with TO 00-35D-54 and satisfy all the items on the attached checklist. Their reports get better replies and more effective action.

"You have my sympathy, Sergeant. But there are several different widget manufacturers, and to correct the problem you reported I will need some more information. You will have to get me the numbers."★



REPORT OF DEFICIENCIES FOUND IN MATERIEL

See Reverse side for Instructions

REPORT CONTROL SYMBOL: LOC-K-205

TO: (Include ZIP Code): SMAMA McClellan AFB CA 95652

FROM: (Include ZIP Code): 181 Ftr Gp Jackson AFB, Your State & Zip

1. REPORT CATEGORY: III
2. REPORT SERIAL NO.: 170FG-RVMR
3. DATE TROUBLE OCCURRED: 2 Jan 70
4. DATE REPORT PREPARED: 3 Jan 70
5. GOVERNMENT FURNISHED PROPERTY: NO
6. PERTAINS TO TECHNICAL DATA DEFICIENCY/IDENTIFICATION: YES

DEFICIENT ITEM DATA

7. NAME AND ADDRESS OF CONTRACTOR (Include ZIP Code): SMAMA McClellan AFB CA 95652
8. NOMENCLATURE: Valve Servo-Dual Input WVC14DB1
9. MANUFACTURER'S PART NUMBER: 1004D
10. SERIAL NUMBER: 668
11. ITEM: NEW / REPAIRED / OVERHAUL
12. DATE OVERHAULED OR REPAIRED: Unknown
13. QUANTITY DEFECTIVE: 1
14. QUANTITY IN USE: 20
15. QUANTITY IN STOCK: 3
16. QUANTITY INSPECTED: 24
17. NO OF PREVIOUS FAILURES: 3
18. FEDERAL STOCK NO (FSN): 1650-622-0228
19. FEDERAL MFG'S CODE: 24671
20. CONTRACT NUMBER: Not available
21. B/L OR SHIPPING NUMBER: 14
22. COMMERCIAL OVERHAUL ACTIVITY: Unknown
23. HOURS IN USE SINCE NEW: 23:00

24. DEFECTIVE ITEM WAS INSTALLED ON OR IS APPLICABLE TO

	PART NUMBER	NOMENCLATURE
A. SYSTEM EQUIPMENT ENGINE, ETC.	PT 10998	Jet Engine
B. UNIT/ COMPONENT OR EQUIP. ASSY		
C. SUB-ASSEMBLY		

25. REASON FOR REPORT: A. FAILURE OR MALFUNCTION
27. DISPOSITION: A. HOLDING FOR INVESTIGATION
29. DETAILS: 1. The Hep Valve operat... was changed for leaking... 2. The hydraulic fluid... assembly-item 45, Fig ... the Hep Valve assembly... 3. This is a sealed u... "O" Ring seal is bad. ... above position. One ... plug & magnet assembly... the valve assembly the... idle for thirty days. 4. Three each photos of ... effective part attached.

30. PREPARED BY: C. V. JONES
31. APPROVED BY: H. L. BYRD
32. DATE: 3 Jan 70
33. DUTY PHONE: 6767

DD FORM 1686

LEAKING

A properly completed form along with a good photograph will expedite correction of a deficiency. The hardware in question is even better.

QUALITY UNSATISFACTORY MATERIEL REPORT

(QUMR, DD FORM 1686)

CHECKLIST

Check Point	DD 1686 Block Nr	Required Information	TO 00-35D-54 Reference
1	—	"Quality Control" type at top of form	Par 3-16
2	1	Report Category	Par 3-17
3	2	Report Serial Number (check for proper format)	Par 3-18
4	3	Date Trouble Occurred	Par 3-19
5	4	Date Report Prepared	Par 3-20
6	5	Tech Data / Deficiency	Par 3-21
7	7	Name and Address of Contractor	Par 3-23
8	8	Manufacturer's Part Number	Par 3-24
9	9	Nomenclature	Par 3-25
10	10	Item Serial Number	Par 3-26
11	11	Item New or Repaired / Overhauled	Par 3-27
12	12	Date Overhauled or Repaired	Par 3-28
13	13	Quantity Defective	Par 3-29
14	14	Quantity in Use	Par 3-30
15	16	Quantity Inspected	Par 3-32

	Check Point	DD 1686 Block Nr	Required Information	TO 00-35D-54 Reference
()	16	17	Number of Previous Failures	Par 3-33
()	17	18	Federal Stock Number	Par 3-34
()	18	19	Federal Manufacturer's Code	Par 3-35
()	19	20	Contract Number	Par 3-36
()	20	21	Bill of Lading or Shipping Nr	Par 3-37
()	21	22	Commercial Overhaul Activity	Par 3-38
()	22	23	Hours in Use Since New or Overhaul	Par 3-39
()	23	24	Defective Item Installed On or Applicable To	Par 3-40
()	24	25	Reason for Report	Par 3-41
()	25	26	Nature of Malfunction	Par 3-42
()	26	27, 29	Disposition	Par 3-43
()	27	29	Details. Follow prescribed Outline? Complete? Clear?	Par 3-45
()	28	29	Distribution	Par 3-13, 3-15, 3-45
()	29	30	Typed Name, Signature, and Phone	Par 3-46
()	30	32	Date Signed by Initiator	Par 3-48
()	31	33, 34, 35, 36	Name, Date, Rank, and Phone of Reviewing Officer	Par 3-49, 3-50, 3-51, 3-52

combat maturity

Capt Victor Vizcarra, AFFTC





THE UNITED STATES AIR FORCE is composed of the best trained personnel in the world, as they were before the conflict in Southeast Asia. At that time most aircrews had received this training and acquired their flying experience under peacetime conditions.

Now with five years of armed conflict in Vietnam, the majority of pilots have served a combat tour. This force has matured and added actual experiences to the mission in which it has been so well trained. Now the question may be asked, "What has this maturity done for the pilot once he has returned to a noncombat assignment?" What has he gained from those moments when the old adrenalin was really pumping as he rolled in on a target that was shooting back, instead of some bombing circles with associated scoring towers? (If you weren't in the ordnance delivery business, don't let the first few paragraphs of this article lose you. The adrenalin pumped just as hard in other missions such as logistical support, FAC, chopper, etc. So read on, you should have matured also.)

To answer this question, it is necessary to review the maturing phases which most individuals experienced in their combat tour.

First, if you'll recall, almost every man was a Tiger, fully confident, maybe even over-confident, because of having received the best training in the world. This confidence in many cases made us forget some of the things we had originally been taught, but not continually practiced. Such as in practice, you always had a standard pattern in the bombing range. Through necessity, it was always the same old range with multiple passes.

You soon learned in the real thing that you just can't fly standard patterns or unnecessary multiple passes. At least not continuously and survive. So you say, "What about that excellent training mentioned earlier?" It was there. You were briefed and trained properly. Remember the

tactical ranges and participation in war games and exercises? However, due to economics and safety, most of the time you practiced on the standard gunnery range. And man is a creature of habit. So with this and the confidence instilled, many reverted to the way they practiced, and had to relearn lessons previously taught.

If you were lucky enough to survive through observation and experience, it didn't take long to mature into the second phase. This is where you became a real professional, putting everything you learned and experienced into accomplishing the mission in the most efficient manner. This is not to say that the well trained but inexperienced combat pilot wasn't accomplishing the mission initially. He was, but he was doing it while taking unnecessary risks due to his inexperience and by relying on old habits. Now that he quickly relearned what he'd practiced during war exercises and on the tactical range, the mission was being accomplished in the manner he was originally taught; get the mission done and get back so you can do it again.

One might say you've reached Utopia, the ultimate, when you've matured to this stage. True, but think back and you went through one more final stage from which one can still draw a basis of good experience. Remember what it was like as your tour was coming to an end? You acquired a case of "get homeitis," but in this case, it made you more cautious. You continued to accomplish the mission efficiently, but with more concern for getting the old pink body home to the land of the big BX. You did this by not taking any chances. Besides becoming a professional, an expert, you also became your own flying safety program.

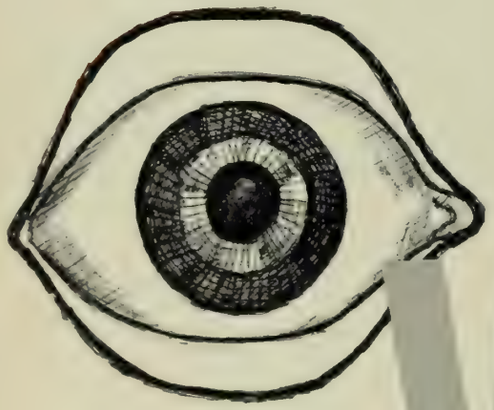
So now that you're back home to what seems like just a routine job, what is the state of your maturity? Unfortunately too many pilots reverted back to that first stage in combat. You're well trained, but over-confident. You haven't been shot at recently, so you're not all pumped up and ready for any eventuality. You've been briefed on emergency procedures, practiced them in simulators, etc., but you haven't experienced the actual event. So, to many pilots, the day-in and day-out flying becomes a routine thing.

Once in a while they'll read a safety article or hear of a friend who experienced an accident or incident which will perk them up for a short time. Unfortunately, not enough to make them the professionals they were once they matured in combat. For instance, how many times have you checked your personal equipment and survival gear before each flight as you did in combat? The point is, why wait to experience an emergency before you really bone up on what you are going to do to handle the situation? In combat, you had everything preplanned. You knew which way you were going to jink as you pulled off the target, for example, before you even took off.

So before you strap in that cockpit for that everyday "routine" flight, preplan and think about what actions might become necessary to make you a professional in your attitude toward the routine mission. And when you're ready to file that flight plan to get home after that TDY or cross-country and you feel "get homeitis" creeping up on you, think back about how you reacted to it during your end-of-tour combat missions. In short, maintain that maturity you acquired from combat; it was earned and it saved your life —and it will continue to save your life in the non-combat environment.

(Reprinted from AFSC *Professional Approach*) ★





VISUAL ASPECTS

your key to avoiding near collisions

Capt James R. Hanson
Piedmont Airlines



These photos were taken 1.25 seconds apart by the lead ship of four RF-84s. The two F-4s do not show on either the preceding or following frames. Although the two flights weren't on collision courses, its obvious that if they had been, the collision would have occurred less than 1.25 after the second photo was taken. From first sighting, the pilots would have had less than 2.5 seconds to react! (Thanks to Maj John Calhoun, Alabama ANG and TAC ATTACK)

ntil such time as a Collision Avoidance System and/or Pilot Warning Indicator is in use, with L aircraft participating, we will tinue to operate in a hit-or-miss ironment.

These systems will reduce the unting communications load ich is part of the radar advisory blem today. There are many knesses in the radar system, so must not let the words "radar tact" lull us into a false security. must educate ourselves for to-'s problem of living with un-wn traffic.

Many collisions and near collis could be avoided by under-ding visual collision avoidance. Many pilots, regardless of their experience level, do not understand rate of closure and, therefore, how to evaluate and take proper action when another aircraft enters their near airspace.

It should have been a part of our original training, but I have never seen a requirement for it in any curriculum. A good understanding of the problem will make a safer and a more relaxed pilot.

The military pilot learns to set up a collision course in order to join up in formation and to hit an aerial target in gunnery. We all, whether realizing it or not, set up a collision course with some point on the ground when we approach for a landing. Let's visualize what takes place.

Whether using an instrumented glideslope or a visual one, there is a predetermined point of interception. If this spot rises on us we will undershoot, if it moves toward us we are overshooting.

In the air the same holds true. When we see another aircraft and it has movement—left, right, up or down—we know that we will not collide. We will pass off opposite to the direction of observed movement. The rate of movement governs the margin of separation.

This means that any turn, climb or descent we make that increases the rate of movement also increases

VISUAL ASPECTS



PICTURES OF THE EARTH as seen from space graphically illustrate something that we pilots have known for a long time: The atmosphere is a layer of brightness surrounding the earth.

But many of us have not stopped to realize that most of the brightness clings close to the surface of the earth. We often fly *above* much of it.

The brightness of the sky is caused by sunlight being scattered by atmospheric particles. And at any altitude the degree of brightness is proportional to atmospheric pressure and density. So at 18,000 feet, you have half the atmosphere —and half the brightness—below you. At FL 400 you have four-fifths of the brightness below you.

Your eyes, recessed beneath the overhang of forehead and brows, are naturally protected from the glare of this atmospheric brightness when you are on the ground. But at altitude, with the light direction reversed, glare floods unhindered into your eyes, causing discomfort and then fatigue. When you're flying without protection from this glare, even in a clear, cloudless sky, your vision outside the cockpit is quickly impaired.

Don't hesitate to use your tinted visor or wear dark glasses when you encounter brightness conditions that will tax your eyes. But be sure the glasses you wear are optically correct, Air Force issue.

the separation. This maneuver need not be violent except in a case where there is a high rate of closure and the aircraft stays in the same relative position.

There is one important thing to remember, YOU CANNOT HIT ANYTHING WHICH HAS MOVED OUT OF THE SPOT FROM WHICH IT WAS FIRST OBSERVED. It must become stationary at some point in order for there to be a collision. A difference of altitude is all that is needed to avoid a collision.

This is all a collision avoidance system needs to accomplish; however, visual avoidance is not that simple, so points need to be learned and visualized. A most common error is turning in the wrong direction, with a consequent increased chance of collision.

The old fighter pilot's rule of always turning toward the enemy and keeping him in sight as long as possible, is still the rule in visual collision avoidance. By keeping him in sight until the danger is past you remain in control of the situation. There is an exception to every rule (see Figure 1). As seen in "D" we would climb if the other aircraft were descending. Carefully visualize yourself in the following level flight and common altitude situations and the "keep him in sight" rule should become clear. Each of these situations may be a near miss but not a collision.

Some might question "D" because it is an automatic near miss but it is a definite near collision not a possible collision. If a turn in the direction of the other aircraft movement were made he would have been lost from sight and there would be no way to know when

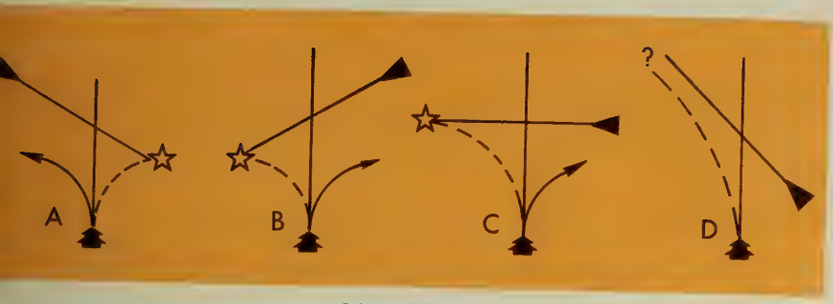


FIGURE 1

ould be safe to turn back. Losing ght means losing control of the tuation and full dependence on the her pilot to see and avoid.

Some points to remember when eeting an aircraft head-on are the llowing: *When head-on and in vel flight*—go down and turn right. own to keep him in sight and turn that if he sees you he will react an opposite turn. (The right turn is an FAA regulation when meeting an aircraft headon).

If you see an aircraft head-on but are uncertain of his altitude look for the following signs. If any belly or underwing shows you should go down and turn right. If you see any part of the top of the airplane you climb and turn right. This is one time when you lose sight of him, but you were already projected to be above him so you are increasing the separation by making him move faster.

A point to remember when looking for called targets is to area scan. Pick an area and stop your eye movement. In this way you will pick up anything moving across this area. In other words, look and stop, look and stop. By virtue of his movement we know he is not a potential collision UNLESS he makes a change of direction which will slow his apparent movement or cause him to become stationary.

The moving target attracts attention and so it is not as hard to see, but the stationary target does not attract attention and is the ONLY one where a mid-air collision results.

(Reprinted with permission of ALPA) ★

ME CATCH SPACE MYO-IA?? You've gotta be kidding—n only flying an O-1!

By the way, what is it—like ntagious?

No, it's not contagious, but it can fect any pilot flying any airplane a clear, cloudless day. It's just e fancy, flight surgeon way of de-ribing the trouble you have when u're trying to scan the sky for ner airplanes and have nothing to cus your eyeballs on.

We've all had the disconcerting perience of knowing there's an-ner airplane at two o'clock, ten les away, and being unable to it—until it suddenly pops up o or three miles close, and you e violent evasive action in the it second before collision would cur. Would you believe this is perfectly normal under certain conditions?

Usually, when you look at an object, your eye takes about one-fifth of a second to bring it into sharp focus. It does this through a process of trial and error, ranging the focus in and out until you see the best picture. When you are looking into an open expanse of sky, or a flat, undefined background of clouds, you cannot pre-select infinity focus—or 12-foot focus, or anything else. Instead, your eye drifts randomly between near and far focus. On the average, your eye is likely to be focused somewhere between three and six feet.

To you in the cockpit, searching the sky for that bogie that is still too small to catch your attention, this is important. Instead of your eyes being at infinity focus, where they will be most likely to notice a tiny speck at the earliest moment, they are focused just the other side of the canopy glass.

But there is a solution. You can learn to make your eyes work for you when you're looking into an empty visual field. The trick is to make your eyes focus at optical infinity and then stare out into that great glaring void.

Optical infinity for the average human is only about ten or twelve meters (call it 30-35 feet) from the eye. So to run your focus out to infinity, look at your wingtip, if it's that far away, or at another bird in the formation. Or at the ground—or anything over 30 feet away. Then, look for that bogie. Your eyes will remain focused at infinity for about 20 to 30 seconds.

EXPLOSIVES SAFETY

for munitions, weapons, and egress techs

MK 24 MOD 4 FLARE

APPARENTLY a red mark on the lanyard of certain of these flares has caused problems. Load crews noted the red mark on the lanyards, thought the flares were armed and got rid of them. Actually, the flares were okay. The red mark is a manufacturer's indicator for proper lanyard installation. Occasionally, due to slips in QC, the red painted portion gets to showing above the top of the ignition dial.

This is a case of the word not getting into the tech data, thus the troops were not aware of the true condition of the flare. OCAMA is having the color changed in an effort to end the confusion.

CHECKLIST DISCIPLINE

WHEN working with explosives there is one thing that must never be forgotten. Explosives are designed to go boom when called upon. Otherwise they would be useless or so hazardous that they would be worse than useless. It is for this reason primarily that step-by-step procedures are spelled out and briefed in the form of checklists. It should not come as a surprise, therefore, when someone is injured as the result of not adhering to the checklist, as the following example indicates.

The load crew was downloading CBUs, two -24s and two -49s, and a sergeant began defuzing a CBU-49. When the fuze was clear of the CBU he saw that the battery firing device was still attached. Then the fuze detonated in his hand.

Supervision was listed as a contributing factor because the crew chief did not personally insure that all fuzes were properly safed prior to their removal. But he was one removed from the primary cause. The sergeant who was defuzing the CBU brought on his own injury because he omitted a vital step in the checklist—*he forgot to install the safety pin.*

BOMB DUMP?

IT WAS five o'clock in the morning, approaching the end of a long night shift when the sergeant left the munitions operating area at an overseas base, towing a trailer with six MK 82 bombs. On the access road going to the flightline, he noticed that one of the bombs was sliding forward on the trailer cradle. By the time he could get his vehicle stopped, two bombs had come off their cradles. Fortunately, this time the only damage was some bent fin

But that didn't change the fa that the trailer was missing two ti down rings—and the sergeant ha accepted the load of bombs in properly secured.

POOR PLUMBING



WHEN a SUU-16 gatling gun starts coming apart—look out! Fortunately, when one started acting erratically on an F-4 recently, the crew quickly aborted the pass and brought the bird (and gun) home. They had made seven varied practice bomb passes on the range and started into the strafe portion of the mission. On the first gun pass it seemed to them the gun was rougher than normal, and the impact pattern on the range was wider, more scattered than usual. When the same symptoms occurred at the start of their second pass, the Phantom crew stopped firing immediately.

On the ground, it didn't take long to determine that the gun barrel diffuser had not been properly installed. It had fallen out on the range during the mission.

In another unit when similar problems arose, the verdict was that their gun plumbers had not been applying the torque to the barrel diffuser that is required by tech data. They promptly inspected all their SUU-16 and SUU-23 diffusers for correct torque.

EGRESS EXPLOSIVES ACCIDENT

TROUBLE often arrives a step at a ime, as illustrated by a recent acci-lent which could have been pre-ented at any one of three points.

First, an aircraft in reclamation tatus did not have explosive egress omponents removed. Next, the auxiliary canopy removal handle safety pin was not installed. Finally, a worker not familiar with egress systems inadvertently pulled the handle, causing the canopy cutter assembly to fire. A sergeant working on the aircraft was injured.

So we have a "For want of a nail . . ." situation. If the explosive egress components had been removed, if the safety pins had been in place, if the worker had known not to pull that handle, there would have been no accident.

MUNITIONS LOADING

BECAUSE theirs is such a critical ob, munitions and weapons specialts must be meticulous in the performance of every task. The following will show why.

Two sergeants were attempting load a CBU-49 on a centerline IER. In an attempt to lock the BU in the bomb rack, excessive upward pressure from the MJ-1 lift and body pressure applied by one of the men on the aft portion of the CBU caused it to pivot on the aft inboard roller. The forward section of the CBU raised over the forward outboard roller and the dispenser fell, damaging the nose and fin assembly and injuring one of the men.

Improper loading technique was the primary cause but there were a couple of contributing factors: Aircraft and other equipment were making a lot of noise and the crew mistakenly thought they heard the front lug lock in the rack; the men were possibly rushing the job. ★

Ops topics

SHORT BURSTS FOR OPERATORS



DON'T DIG

The mission was air combat maneuvers and the flight of four F-4s had split up into two elements. Lead of the attacking element had accelerated to Mach 1.2 in a nose-low turn pulling five to six G. As he closed to gun range his concentration on the tracking problem intensified and he increased back pressure to keep the picture the way he wanted it. Just about that time the airplane decelerated to subsonic—and he felt it dig in.

With the pass pretty well fouled up he broke it off, and noticed 10 G on the meter!

After he landed, the maintenance people found the right engine forward mount had failed and the whole engine had shifted.

The F-4 in this incident had just been modified with TCTO 831, the three-pound bobweight, which gives you a considerably lightened stick feel force in pitch. The pilot, with over 600 hours in the bird, had a well-developed feel for the less sensitive elevator control before the mod.

But there's more to it than that—any F-4 will dig in as it goes from supersonic to subsonic if you're holding G. And it says so right in the Dash One. The aerodynamic effectiveness of the slab increases as you decelerate through the transonic speed zone. So even if you don't move the stick under these conditions, you're going to increase G. Of course, if you squeeze in a little more G at the critical moment, as this pilot did, you're just asking for trouble. And it can be abrupt at high G.

So think about it next time you're in a similar situation. The maintenance guys get real unhappy—and besides, it can ruin a good pass.

CHINA, BURMA, INDIA
HUMP PILOTS ASSOCIATION

25th
Annual Reunion

RAMADA INN
MONROE, LOUISIANA

AUGUST 28, 29, 30, 1970

For Information Contact:
Herb Fisher
Port of New York Authority
111 Eighth Avenue (Room 1409)
New York, NY 10011
Telephone: (212) 620-8396

TIRE INSPECTION

Maintenance is constantly looking for more efficient ways of getting the job done faster. One such time saver some bases are now using involves postflight tire inspections. This system calls for stopping the aircraft a few feet from its final parking spot, inspecting the tires (in accordance with TO 4T-1-3, para 3-3), then having the aircraft commander taxi the few remaining feet to the final parking spot.

This system seems to be working well, except for a few cases in which pilots didn't know what was going on. Reports indicate that some thought they were being stopped because of an emergency, such as fire.

So, Mr Aircraft Commander, if Maintenance tries to

top you before you are all the way into the hole, it's robably so the ground crewmen can look at that part f your tire that will be on the ramp when you make our final stop for the day.

ERO CLUB SAFETY AWARDS

Thirty-three USAF Aero Clubs earned FAA Flight afety Awards for accident-free operation in 1969. The wards were presented by FAA Administrator John H. haffer in a ceremony at FAA headquarters.

Aero Clubs are an important part of the Air Force ecreation program with more than 10,000 members 76 clubs operating 424 aircraft. Flying in 1969 pproximated 265,439 hours.

Award winning clubs:

Otis AFB	Griffiss AFB
Oxnard AFB	Robins AFB
Perrin AFB	Arnold AFS
Stewart AFB	Hanscom Field
Chanute AFB	Holoman AFB
Randolph AFB	Los Angeles AFS
Vance AFB	Maxwell-Gunter AFB
Charleston AFB	March AFB
McGuire AFB	Ramey AFB
Castle AFB	Westover AFB
Ellsworth AFB	Whiteman AFB
Grissom AFB	



NSCOREABLE AT 7

The F-4 crew wasn't familiar with the range, but ey'd been through a complete briefing. Arriving at e range, the flight had to hold while some work was done on the targets. When the range officer finally cleared them on the range, he told them to drop on "the barge." This was a bit confusing to the new crew, because there had been no mention of a barge target during the briefing—there had been a ship target. Then suddenly they spotted a sunken barge in the water, set up their pass and dropped a Mk 106. Impact was 8000 yards short of the pre-briefed ship target.

Two lessons in this one: Use the right terminology; if the manuals call it a ship, don't call it a barge. But more important, if you're uncertain about which target you've been assigned, go through dry. This time it was just a sunken hulk and no one was injured. Next time it could be a lot worse.

FLIP CHANGES

In future issues, this space will be used to provide notice of forthcoming changes to DOD Flight Information Publications (FLIPs). Changes, as they occur, are noted internally in the products. However, the Aeronautical Chart and Information Center (ACIC) has requested the assistance of **Aerospace Safety** in providing advance information. ACIC, located in St. Louis, Missouri, is the DOD Executive Agent for world-wide production and distribution of Flight Information products.

ARRESTING SYSTEMS

Only six Emergency Unsatisfactory Reports (EURs) were submitted on USAF aircraft arresting systems during 1969. That figure is inconsistent with barrier problems reported through other media—such as excessive rollback following arrestment, cable and tape failures, deck sheave bearing failure, troubles with remoted MA-1A systems on wide runways, and jet-blast effects on MA-1A intermediate barrier stanchions. This indicates that numerous problems are not brought to the attention of the proper agency for correction.

(AFSC Safety Management Newsletter)



ANALYSIS OF AN ANALYSIS for Phantom Phlyers

In the article "Analysis of an Incident," (April '70 issue) we made a significant boo-boo. The article concerned BLC malfunction immediately after takeoff, and what you do when the BLC light illuminates after you've raised the flaps—and then goes out after a few seconds.

In the first paragraph on page seven, we said, "...when the BLC light goes out treat it as you would a fire warning light—check the circuit." At first reading it sounds like a good idea, but the trouble is you can't check the BLC light circuit from the cockpit. You can check all the lights on the telelight panel, but all you accomplish is a check of the bulbs, not the circuits.

On page eight we said, "...If the aircraft commander had checked the warning light circuit...he would have been able to minimize the damage to the airplane..." We all agree now there's no way to effectively check the circuit. The only course of action when you've seen a BLC light is to lower the flaps, leave them down, and bring the bird back home.

TVOR VOICE

Reference "Into the Hillside" in the February 1970 *Aerospace Safety*, I assume the accident involved an F-106 aircraft. It mentioned that the pilot failed to monitor the TVOR voice frequency on the ILS receiver. Having flown the bird for eight years, I have yet to receive TVOR VOICE ON THE ILS receiver due to the fact that there are 20 preset ILS frequencies, all ending in odd tenths MHz.

If you have information about how to receive a TVOR on an ILS frequency, I will be happy to pass it on to our jocks.

Maj Frank P. Walters
95 Ftr Intcp Sq
APO San Francisco 96570

When we called the squadron involved in the accident we were briefing, we learned that they have placed their local TVOR frequency in channel 20 of the ILS receiver. Unless you have a requirement for all 20 ILS frequencies, this sounds like an excellent idea.

KUDOS FOR "AEROBITS"

I wanted to take a minute and thank the staff of *Aerospace Safety* for the help that magazine has been to me, and I'm sure to many others. I am a Physiological Training instructor and for the past four years have used your articles for emphasis in every lecture I've given.

In combining the safety magazines, I hope you will not do away with the AEROBITS feature. This area has truly been of interest to me since it gives "good poop" in personal equipment, egress and so many other fields.

SSgt Noel F. Tillman
4780th USAF Hospital
Perrin AFB, Texas

See "OpsTopics," page 38.

POMOLA

The February issue of *Aerospace Safety* depicts the Navy's POMOLA. As suggested in the accompanying article, POMOLA may be an answer to some of our problems with landing short, particularly at forward operating locations such as encountered in SEA. It may also be an answer to the problem of cargo aircraft landing long and fast under these same conditions.

Are there any Air Force projects presently under way to look into the feasibility of using POMOLA for forward airfields where more sophisticated systems are either unjustified or impractical? Now that the C-130 is getting an angle of attack indicating system, some form of visual glide slope indicator is needed for a complete VFR precision landing system. I feel that the POMOLA concept could be incorporated in a lightweight, easy to install system that combat control teams could erect quickly along with the standard runway marking panels they now use. Would you please send any information you have available on POMOLA, including addresses to which I can write to get the views of organizations actually using the system.

Capt Henry A. Stevens, III
Dyess AFB, Texas

We are sending you a copy of a blueprint supplied to us by the Navy along with a Poor Man's VASI that Colonel Erbe of this directorate installed in Vietnam. If we can be of further help, let us know.

☆ U. S. GOVERNMENT PRINTING OFFICE 1970 391-399/10

UNITED STATES AIR FORCE

WELL DONE AWARD

Presented for outstanding airmanship and professional performance during a hazardous situation and for a significant contribution to the United States Air Force Accident Prevention Program.



First Lieutenant
Alan O. Williams

22d Special Operations Squadron, APO San Francisco 96274

On 29 June 1969, Lt Williams was flying as wing
an in a flight of two A-1s on a night combat mission
Southeast Asia. Over the target area at 8000 feet,
e engine of Lt Williams' aircraft stopped running,
en started again with heavy vibrations accompanied
widely varying RPM, manifold pressure, and torque
ter indications. Lt Williams jettisoned his ordnance
d headed for one of two emergency landing fields.
left the power where it was at the time of failure,
psi torque and 2200 rpm, and began a slow climb
140 KIAS. A check with both emergency fields
owed that the weather was below minimums, so Lt
lliams headed for the nearest suitable airfield, 110
utical miles away. He was able to climb to 15,500
t with the power available. Twice, on the way to
alternate, the engine quit, but he was able to get
restarted both times. At 12,000 feet and 22 miles
m the field, the sump warning light came on. The engine erupted in a flash fire, then quit completely. Since he was unable to get a restart, Lt Williams shut down the engine, placed the propeller in low pitch and set himself up for a deadstick landing at an unfamiliar field. He turned off all non-essential electrical equipment, including all radios except FM, to conserve battery power. Communications were spotty between him and Lead because of a rapidly failing battery. He positioned himself at high key, 5000 feet above the runway, lowered the gear and one-half flaps and made an uneventful forced landing, touching down in the first 2000 feet of a 10,000 foot runway.

Although a relatively new pilot graduate, with 440 hours total flying time, 110 hours in A-1 aircraft, Lt Williams proved himself entirely capable of handling a serious inflight emergency terminating in a successful night deadstick landing. WELL DONE!

signs of our times



HIGHWAY		SKYWAY	
STOP	=	1 X	aircraft grounded until repaired
SLOW	=	2 —	aircraft inspection required or overdue–condition unknown
	=	3 /	a known hazard–proceed accordingly
RESUME SPEED	=	4 S	aircraft has no known discrepancies

CONSULT TO 00-20-1, SEC 3 FOR PROPER SYMBOL ENTRY ON AIRCRAFT FORMS

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A5

AEROSPACE SAFETY

UNITED STATES AIR FORCE • JULY 1970 •

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UNITED STATES AIR FORCE

Aerospace SAFETY

JULY 1970

FOR AIRCREWS, MAINTENANCE & SUPPORT TECHNICIAN

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DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

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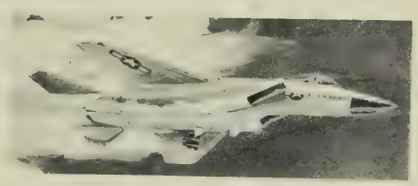
JULY 1970 AFRP 127-2 VOLUME 26 NUMBER 7

The F-15 AND SYSTEM SAFETY

LAST DECEMBER after more than five years of studies and intense competition, the McDonnell Aircraft Company was awarded the contract to build the F-15 air-superiority fighter for the Air Force. Pratt and Whitney is building a brand new afterburning turbofan to power this twin-engine airplane. This will be the first new fighter aircraft for the USAF since the F-4 and the first USAF fighter designed specifically for air superiority in almost 20 years.

With very few exceptions, Air Force pilots have always been at a disadvantage in thrust - to - weight ratio, turning ability, and some of the other performance factors that are important in a technically unexcelled "air superiority" fighter. In World War II, the *Thunderbolts* and *Lightnings* were technically outperformed by some of the lighter, faster enemy aircraft. In Korea the F-86 came close to matching MIG-17 performance but was still on the short end of the stick. In the air

Major Robert M. Greene,
Directorate of Aerospace Safety



CONTINUED

The F-15 AND SYSTEM SAFETY

war over North Vietnam, our F-4s and F-105s were still outperformed by the MIG-17s and MIG-21s when it came to the classic "turn and grunt" rat race. Nevertheless, from World War II through Korea to Vietnam, the American airman has compiled an impressive record of kills which stands as a tribute to his training, skill, courage and determination. This individual excellence has masked the aircraft performance edge that has generally gone to the enemy.

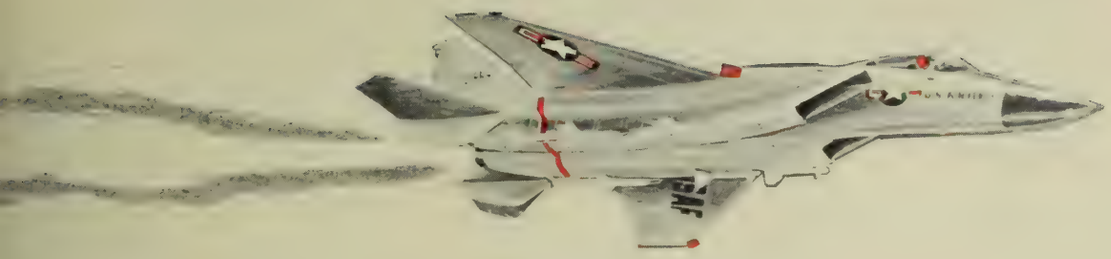
But the F-15 brings a new era to air superiority. The American pilot will have a greater thrust-to-weight ratio, lower wing loading, better cockpit visibility, and better armament (including the SRM or "dogfight" missile) than any aircraft possessed or forecast for the "threat" powers through the 1980s.

For the first time, the American fighter pilot can go into combat in a machine that will outturn and outshoot his opponents.

How are we going to build an aircraft like this? It didn't just happen. It has taken years of agonizing effort by some of the best people in the Air Force. These people realized that we could not build an "all things to all people" aircraft and have a true air superiority fighter. The concept of energy-maneuverability has been very diligently applied to this aircraft. Consequently, weight has been kept to an absolute minimum, as has the gadgetry and systems that inevitably try to attach themselves to any system.

PERFORMANCE is not the only aspect of F-15 development that has been considered. The reliability requirements established for the F-15 are more stringent than in any previous fighter. Avionics, airframe, and armament systems reliability requirements have necessitated a new approach. System/cost effectiveness procedures have been applied to evaluate the functions of the total system, insuring that each function and each component are combined to produce the best weapon system for the dollars expended. In addition, the total cost of the F-15 weapon system has been under continuous scrutiny, so several features which would increase the system's overall effectiveness have been eliminated due to the austere funding environment.

Survivability/vulnerability (S/V) is receiving more emphasis than ever before. Our S/V lessons from the war in Southeast Asia are being applied to the F-15.



Extra attention is being given to he all important maintainability of he F-15.

These are just a few of many spe-ialized disciplines that are being pplied to the F-15 and its engines. The final result of all these efforts hat are being expended before ardware is produced should be a veapon system that will require few-r redesigns, modifications and ret-ofits, and less money spent as a re-ult of ECPs than any other fighter ircraft yet built.

Pratt and Whitney is running a milar program on the design of ie engine for the F-15. The desig-ation for the engine, under the new ystem, is "F-100," of all things!

But one of the most remarkable anagerial aspects of this program the long range planning by the PO to reduce the cost of the pro-am by reducing the accident rate. ach year we waste millions of dol-rs by bashing aircraft all over the orld. Aircraft and lives are lost due many cause factors, including mbat, weather, pilot errors, ma-iel failure, and a whole host of ier miscellaneous reasons, some which we have little or no control er. But a substantial number of craft (not to mention missiles, unitions and other equipment) are lost each year due to what we call *design deficiency,* and this is something we *do* have some control over.

Millions more are spent in the retrofit and modification of aircraft and other systems to eliminate design deficiencies. This is not to imply that aircraft designers are negligent. There are several reasons why safety critical design deficiencies appear in the final design of an aircraft. Some are as a result of the simultaneously increasing complexity and performance of our new aircraft. It becomes more and more difficult for a single individual to have sufficient visibility over the system to foresee all the design safety problems. Designers of individual components or subsystems do not always have the "big picture" as to how their designs integrate into the total system and interface with other designs. This has made it necessary to employ a formalized safety engineering program on our new systems. If the point is not yet made, then consider the fact that we do not have an aircraft flying today which has not undergone a major retrofit modification as a result of an accident or series of accidents!

So with this knowledge in mind, the managers of the F-15 program are requiring McDonnell and Pratt and Whitney to perform several different types of safety analyses on the design of the aircraft and engines. These analyses are directed toward eliminating the features in the design that could eventually cause an accident. This relatively new approach to accident prevention is called "System Safety Engineering." Although we say that it is a new approach, it has actually been applied to nuclear weapons since their beginning. And the record for nuclear weapons is impressive in that there has never been an accidental nuclear detonation.

THE FIRST TIME System Safety was applied to another type of system was with the Minuteman missile, and the reduction in accident rate for the Minuteman over previous missiles has been substantial. System Safety was first applied to an aircraft during the development of the C-5A and then later to the A-7D. As a result of the system safety analyses numerous safety deficiencies were corrected in both aircraft before the hardware was ever flown.

The basic philosophy behind the system safety approach is founded on the assumption that sooner or later parts will fail, maintenance

CONTINUED

The F-15 AND SYSTEM SAFETY

personnel will perform improper installation or repair operations, and pilots will make mistakes in judgment, technique, etc. The system safety engineer asks, "What happens if one of these failures occurs?" The result is a list of hazards which are categorized as to consequence. A hazard that would result in the loss of the system and/or the crew is called a Category IV hazard. Hazards that *could* cause loss of aircraft and/or crew if rapid action is not taken are called Category III. Category III and IV hazards are eliminated by redesign, or warning or protective devices are provided or appropriate procedures are inserted in the flight handbooks.

Another area where more safety emphasis is being placed is in the "lessons learned" category. Data from previous accident experience has been analyzed as has AFM 66-1 maintenance data. Bad design practices which have caused hazards in other aircraft have been identified and steps are being taken to insure that these practices are not repeated in the F-15. In addition, these lessons learned are inserted into the AFSC Design Handbooks for future reference and use.

Here are just a few examples of hazards that already have been designed out of the F-15. Each of these hazards has caused the loss of several aircraft of a particular type and some aircraft types have suffered losses due to all of these hazards.

1. In case of flight control linkage disconnect or battle damage, control surface(s) will fail to a nominally neutral position rather than to a full travel position.

2. In case of a jammed stick (tools/FOD in the works) stabilator control is still available through the command augmentation system (CAS) which is actually an electrical (fly-by-wire) connection between the stick grip and the control surface actuator. The aileron has a safety spring cartridge which allows control of one aileron, if the other is jammed.

3. The fuel system requires no management by the pilot except for drop tank selection.

4. Fuel lines are submerged in the fuel tanks, except where absolutely necessary for them to be outside.

5. The primary heat exchanger is as close to the compressor bleed air valve as possible. Air exiting the primary heat exchanger is below the autoignition temperature of aircraft fluids.

6. Most equipment and lines have been removed from the engine bay to reduce the possibility of an engine bay fire.

There are many more examples of hazards that are being closely watched in the design of the F-15, but these few illustrate the fact that more safety is going into the *original* design of an aircraft than we have ever had before.

Another significant requirement to be applied to the development of the F-15 is the construction of a mathematical model of the system. This model is a computerized representation of the F-15 that is used to evaluate the safety impact of changes in the design, to identify safety problem areas and to actually predict F-15 safety performance and accident rates. There are other mathematical models of the F-15, including a reliability model and a performance model. All of these models are put together in the system cost effectiveness model which predicts total system performance.

And speaking of predictions, the F-15 is the first fighter aircraft to have a contractual requirement as to accident rate. The requirement is directed toward the objective of achieving no accidents during the first 5000 hours of flying time starting at first flight. In addition, McDonnell has been given the goal of a maximum cumulative accident rate of eight per 100,000 flight hours at the 200,000 hour time point. This reduced accident rate is better than what could be expected from improved technology alone, and McDonnell is predicting that, with the rigorous application of system safety engineering, the accident rate goal can actually be bettered.

System Safety is something that *will* pay off for the F-15. Our hardware is too expensive for us not to put a full time effort into a safety oriented design. So the young pilots coming up will enjoy a unique mating of two seemingly contradictory characteristics. They will truly be operating the world's best and safest fighter! ★

THE I.P.I.S. APPROACH

By the USAF Instrument Pilot Instructor School, (ATC) Randolph AFB, Texas

VFR TAKEOFF

Q Can a tower controller deny me permission to take off VFR if I filed an IFR flight plan?

A No. FAA Manual 7110.8A specifically states that "if the facility responsible for issuing the IFR clearance is unable to issue a clearance because of traffic conditions, (the tower controller will) relay this information to the pilot and (will, most likely,) suggest the delay be taken on the ground." If the pilot insists on the VFR takeoff, the controller will issue takeoff clearance as traffic conditions permit.

VISUAL SEPARATION

Q What does the term "Visual Separation" mean and how does it affect me as a pilot?

A The term "Visual Separation" is used by air traffic controllers as a means of separating IFR, and special VFR (SVFR) aircraft in terminal areas. In order for the air traffic controller to use "Visual Separation" he must see the aircraft involved and issue information and instructions, as necessary to insure that the aircraft avoid each other. As a pilot, you must see the other aircraft involved and upon instructions from the Controller, provide your own separation. You may have to follow in-trail or keep the other aircraft in sight until it is no longer a hazard. If you accept the traffic information and instructions to follow or provide visual separation from another aircraft, the Air Traffic Controller considers this acknowledgement that you see the other aircraft and will avoid it! Ref FAA Manual 7110.8A.

ENROUTE DESCENT

Q Do I have to accept a turbojet enroute descent?

A It is the pilot's responsibility to *request* a high altitude penetration/approach if he does not want normal arrival handling (enroute descent). It is all the pilot's prerogative to elect to conduct a published high altitude penetration instead of an enroute descent. Ref FAA Manual 7110.8A.

MINIMUM ALTITUDE/DECISION HEIGHT

Q Are FAA GCA Controllers required to call minimum altitude/decision height?

A Ref FAA Manual 7110.8A, para 750. No. Only United States Air Force and Navy Controllers are required to inform the aircraft when it reaches the published altitude minimum/decision height.

Q As a helicopter jock, what category minima do I use for approaches?

A Presently, helicopters use published Category A minima. It has been proposed that USAF helicopters be allowed lower visibility minima (one-half Category A minima) to determine if an approach may be started. This would apply only if there was not a specific helicopter procedure published in accordance with AFM 55-9 (TERPs). If the proposal is approved, it should be included in the next revision of AFM 60-16.

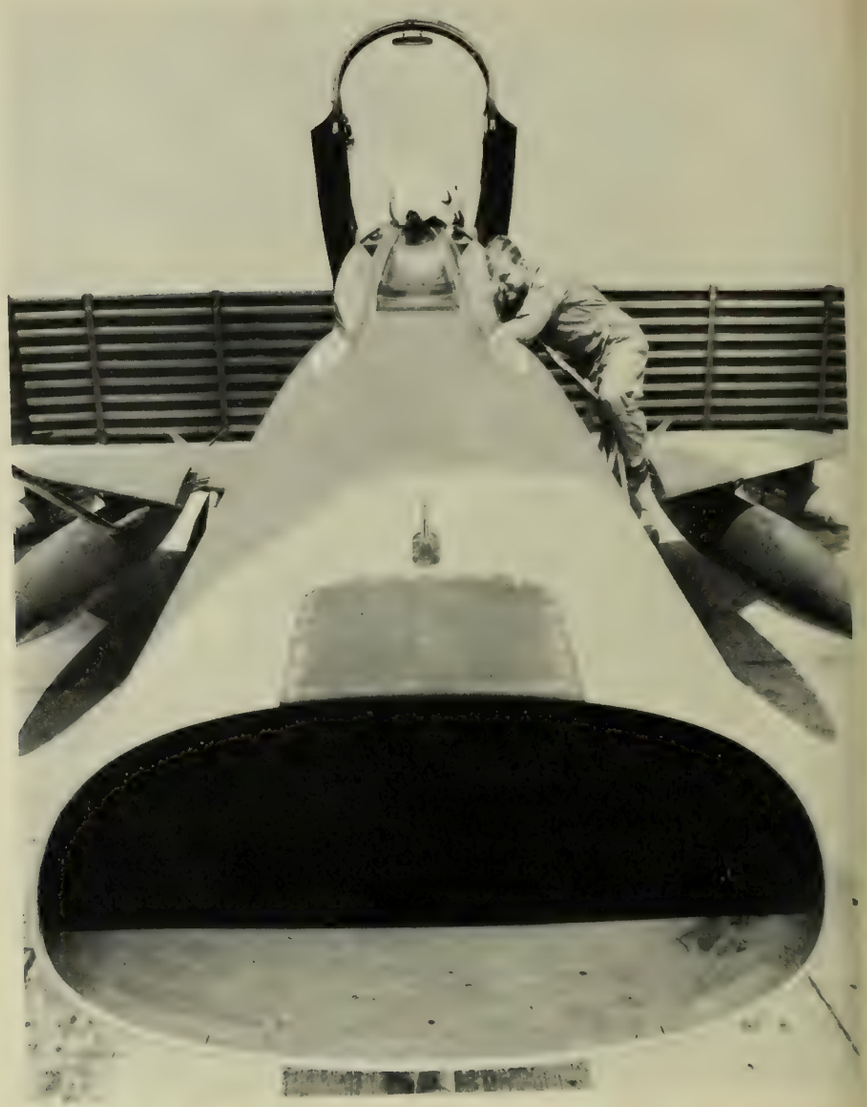
POINT TO PONDER

The revised AFM 51-37 will delete the maximum outbound times for the procedure turn. This was done to allow the pilot to utilize the airspace allocated for the published procedure. A maximum time outbound of one and one-half or two minutes is an unnecessary restriction when a *remain within* distance is published in the profile view of the procedure. The pilot himself can best determine the necessary time outbound after considering speed, wind, descent gradients, etc.

NOTICE

Reference March 1967 "IPIS Approach" article. The answer to the question, "What are the tolerances for operational check of the aircraft's TACAN equipment?" is now erroneous. FLIP, Section II, paragraph 1c(3), lists TACAN receiver check point tolerances. "TACAN receiver check point tolerances: Military bases normally designate a specific ground point for checking the accuracy of aircraft TACAN receivers. The tolerances for the ground check are similar to the VOR within + or − four degrees of the designated radial and within one-half mile or three per cent of the distance to the facility, whichever is greater." ★

tech orders cannot supplant judgment



BY THE BOOK?

LT COL ROBERT PICHT, DIRECTORATE OF AEROSPACE SAFETY

After all the effort expended by both the pilot and the maintenance types, there are times when an aborted sortie really hurts. You may feel that you need a pretty good reason to turn down the bird and sometimes it's tough to convince other people that there really is something wrong. Both pilot and crew chief may be tempted to press on and the pressure to accomplish the mission may be pretty strong.

The critical time arrives as your crew chief prepares to strap you into the cockpit. The heat reflecting off the ramp has soaked through your flight suit and G-suit, you've timed your walkaround and conversation with the crew chief so you arrive in the cockpit with just enough time to run the checklist, make an on-time start and check in with the flight leader. Although you've spent no extra minutes perspiring in the cockpit, you're eager to get in the air and get the cool air flowing through the vents. The crew chief is anxious to cool it in a shady hangar.

Then on engine start something goes awry. An engine instrument reads high—or low; it's not where it usually is. But it's within tech order limits. Do you check it out? Do you abort?

In one case about like this, while starting an F-100, the pilot saw the EGT go considerably higher than he had seen it before in the 1500

hours he'd been flying the Hun'. There was no tail wind, no external reason for the high temperature. And although it hadn't exceeded the limit for a start, it was definitely different from a normal start.

He aborted the flight and wrote up the bird. The maintenance people screamed loudly about the lost sortie. They insisted the aircraft was okay and signed off the write-up as "entered in error, temperature was within TO limits." They made no investigation to determine what caused the unusually high starting temperature.

Several flights later, a pilot reported an over-temp that went beyond limits. This time the maintenance folks dug into the engine and diagnosed a faulty fuel control. But the engine had to be pulled and sent to overhaul.

On another occasion, while he was preparing for an FCF, a pilot discovered 15 minor squawks before he had completed his preflight. He refused to fly the bird and requested a QC spot inspection. Of course, the maintenance types were ready to string him up. They insisted that none of the squawks warranted grounding the airplane and that he should have flown the FCF.

Quality Control inspectors found eight (count 'em—8) red cross discrepancies. They were all in locations where a pilot's preflight wouldn't find them.

The point of all this is that good judgment should dictate an automatic investigation when an unusual situation arises. Sure, the TOs set limits and prescribe what conditions ground an airplane, but blind adherence to these limits isn't the way to prevent accidents. (It may keep the abort rate down.)

A suspicious attitude toward out-of-the-ordinary occurrences may cost a few sorties, but it can save an aircraft—to say nothing about the pilot. ★

LOST and DOWNED

BRIEFS OF RECENT AIRCRAFT ACCIDENTS

A-1H Student pilot on initial flight in an A-1H (single-seat) aircraft had previously completed 23 sorties, three solo, in the A-1E. First landing was good, but slight veer on TD caused pilot to go around. Second landing was a perfect three-point touchdown, but right wing came up and the aircraft veered right. Pilot applied power and aircraft yawed abruptly to the left. Landing gear separated as aircraft slid across the runway. The pilot evacuated successfully. Pilot had no tail wheel experience prior to entering A-1 transition. However, with some 60 landings in the A-1E prior to the accident, he was not inexperienced. He failed to use proper corrective measures for crosswind.

RF-4 Following electrical failure the pitch aug, INS and fuel low level lights came on. Then intercom, UHF radio, flight instruments and generators failed, leaving the pilot on needle and ball. During landing pilot found controls sluggish, got into high sink rate. Aircraft struck a tree on final and the navigator ejected successfully; pilot landed the aircraft. Depot-level maintenance caused the electrical malfunction. Pilot unfamiliarity with sluggish control when pitch aug is inoperative contributed.

B-52D Aircraft was returning from a day combat crew training mission with Nr 7 engine shut down due to an indication of low oil pressure. Gross weight was 270,000 pounds when a VOR/ILS penetration was started. Weather was clear with a four knot crosswind. The aircraft appeared to flare higher than normal and float excessively. At about the 9000 foot remaining marker on a 13,500 foot runway, the pilot applied power for a go-around. Improper pilot techniques and procedures for the go-around resulted in loss of control. The aircraft entered a low speed buffet, hit the ground to the side of the runway in a slight wing down, nose high attitude and was destroyed by fire. Three crewmembers received major injuries, while six received minor injuries.

T-37 During a Cuban 8, solo student misapplied controls and got into a spin. When he noticed 4000 feet on the altimeter, he ejected; however, IP flying at 12,000 feet saw the student in his parachute above his (IP's) altitude. Apparently student misread the altimeter by 10,000 feet and ejected at about 14,000.

F-100 Aircraft was lead of a two-ship flight. At about 145 kts, the pilot aborted after deciding the aircraft was not accelerating properly and would not become airborne. The aircraft engaged the BAK 9 and MA-1A barriers and came to a stop on the overrun 500 feet from the end of the runway. Nose gear collapsed and the aircraft caught fire. The wingman became airborne easily at the time the leader initiated abort. A rupture found in a pitot line could have been caused by inadequate draining and subsequent freezing. Cause of the upper and/or lower nose landing gear link assembly failure could not be determined, but it is possible that torque value for the upper torque link of the nose gear scissors was incorrect. ★

a sure thing



ANYBODY LIKE TO BET on a sure thing? That's a pretty rare item these days, but we think we have one that will fill the bill. No horses, stock market or roulette. Just a simple hash-out of statistics. The old story is that you can use figures to prove anything, but this time we'll cover all bets.

Our bet is that some jock will ding an airplane short of the runway when there is *nothing* wrong with the pilot physically, the bird mechanically or the approach aids on the ground. In other words, the only answer will be that some wise guy delivered several loads of lift-less air to the approach end of the runway and dumped them there. We'll even go you one better; this short landing will happen under VFR conditions and is just as likely to occur during the day as dark time.

Any takers? Is somebody going to bet it won't be he? We've pretty well covered our tracks, too. If you're a proficiency-only pilot, you find yourself down at the bottom of the proficiency scale; if you fly a bunch, you're highly skilled but your exposure is high. In a nut shell, nobody is immune! If you happen to be the unlucky guy, you'll find yourself in some rather fancy company —from squadron commanders to UPT jocks.

So you say, "What's the answer?" We wish we knew! It's like how do you keep from three-putting? If there were a sure-fire cure, you'd be the first to know. We often wonder, though, if the birds that do hit short, for no *apparent* reason, have operators that are using all the landing aids available to them. After all the tons of type that have flowed across the printer's press, we think that just about every type of illusion, nav aid, wx phenomenon and pilot factor has been discussed. But we press on in hopes that a sentence may stick in a pilot's mind and save just one life or aircraft. Maybe someday we'll find the magic formula so let's dissect some of our past bashes and see if there's a helpful clue hidden between the lines.

REMEMBER the one about the T-33 on a night instrument mission? The weather was CAVU. The guy under the bag had just turned final on a VOR non-precision approach and was descending to 1500'. Gear was down and flaps set prior to low station passage. About this time there was a hairy jolt followed by numerous bumps and bounces. That's right—the bird had touched down miles from the runway, fortunately on fairly smooth terrain. Cause: The back seater had misread his altimeter 1000'. That's understandable, but how about the guy in front. He had not checked his altimeter but why should he? It was VFR and after all he could see, couldn't he?? From this accident we derive *Axiom #1*—the eyes don't have it. They will lie to you, just like the seat of your pants. An added piece of advice: On a clear night, without good reference points, lights will appear closer than they really are.

NOW LET'S TALK about the *Thud* pilot faced with 200' and one—day —light wind—wet runway of 9000'. Of course he'll take a GCA! His plan is to get about a mile and a half from the runway and then start dropping "5-10-40" feet low to make sure he lands on the first 1000' - 1500' of concrete. Why? Some of us haven't really looked into the geometry of why, but the Aeronautical Systems Division (ASD) did.

ASD knew the big birds with reverse thrust and short landing rolls don't sweat long landings too much so they took a close look at our fast flying finalers. On a standard 2½° glideslope, Fred Fighter Pilot is about 160' above his landing point and 4000' from it horizontally. At this very same point, using a typical overhead pattern, Fred is at 100' instead of 160'. To get into a position where his visual cues tell him he should be, he's got to get rid of an extra 60' of altitude. He subconsciously knows that unless he attains this familiar approach, he'll land long—thus he instinctively starts to bleed off some of this extra air farther out so that he breaks out from a GCA or ILS at what he "estimates" will be this familiar slot.

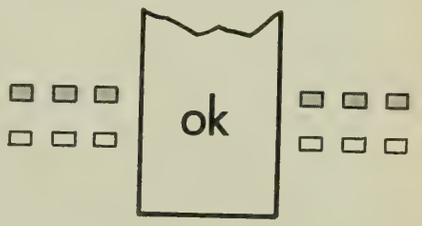
Estimates being what they are, instead of a breakout, we get a break up and burn out. "Pilot was advised by controller he was dangerously low on glideslope just prior to impact." Sure, some guys don't fly such good gages, but we think some intentionally try to hedge on a precision glideslope for the reason we mentioned. Do you?? If you've read this far you may begin to think we've painted ourselves into a corner.

First, we say, if you stay on the glideslope you land long, and if you slide under, you got a good chance to wrap it up in a ball, short. So what do you do? No one advocates flying low on GCA final but we know it's done. Follow the controller's instructions until you are visual and can pick up the VASI.

The next move you don't make is to dive at the runway. Struts are valuable and so are vertebrae. If you get into this box, land it normally. Much better the barrier than a busted bird. If you know the weather is so low that the Dash One says you will have problems stopping, perhaps a closer look at the operational requirements of the mission will dictate a delay 'til conditions improve.

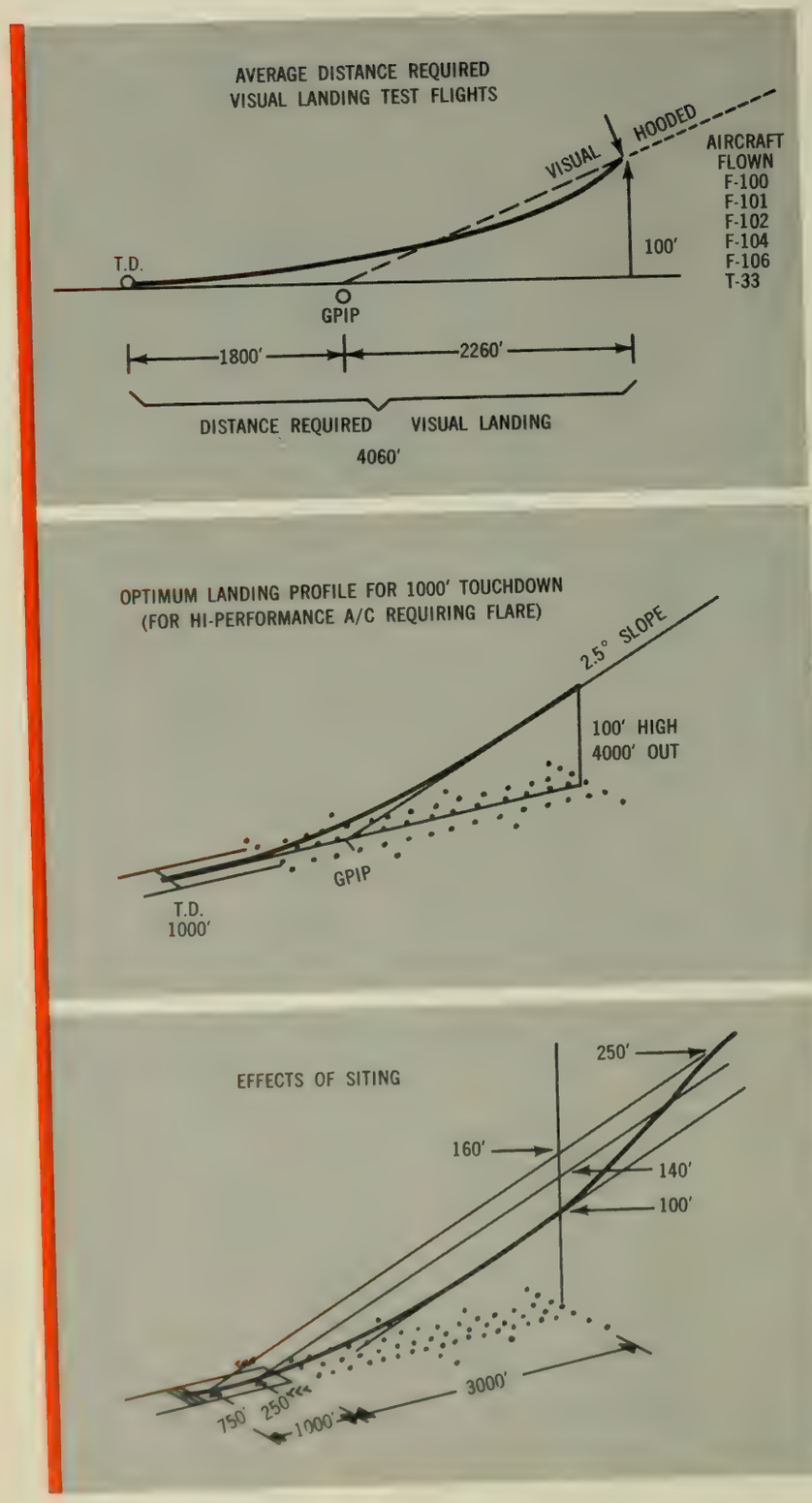
We all pride ourselves on the ability to "hack it." Maybe we can, but sometimes the law of physics slaps us right on the behind when we need it least. Our proficiency may be good enough for 50' and an eighth but when the time comes to flare out, we find our touchdown point is opposite the 4000' marker on an 8000' strip. It takes X long to stop an aircraft weighing Y much and going Z fast, and nobody can change the laws of deceleration. So — it's no reflection on your ability when you cancel out because of poor conditions.

Axiom #2. A precision GCA glideslope is *not* designed to land you zero-zero. You've got to have some space left when you break out to "do your thing." If you're in a bird that doesn't have reverse thrust but requires a high speed final, and



CONTINUED

a sure thing



you have to fly the glidepath to 100' and a quarter, *you're going to land longer than normal!* (Except perhaps in the F-4.)

We can't give you a solution for every situation. There are too many combinations, but we can tell you what SAC did to make their glidepath more realistic for their B-58s.

Several years ago a number of B-58s landed short of the runway over a short period of time. In their analysis of the problem, it was decided that the primary factor for the short landings was that the pilots were having to dive at the runway in an attempt to land on the first couple of thousand feet. The reason they had to make this dive was that the GCA glidepath placed them too high at minimums to make a "normal" touchdown. Solution—relocate the GPIP (the point where the glideslope intercepts the runway). In order to place the pilot where he wanted to be, the GPIP was located short of the threshold!

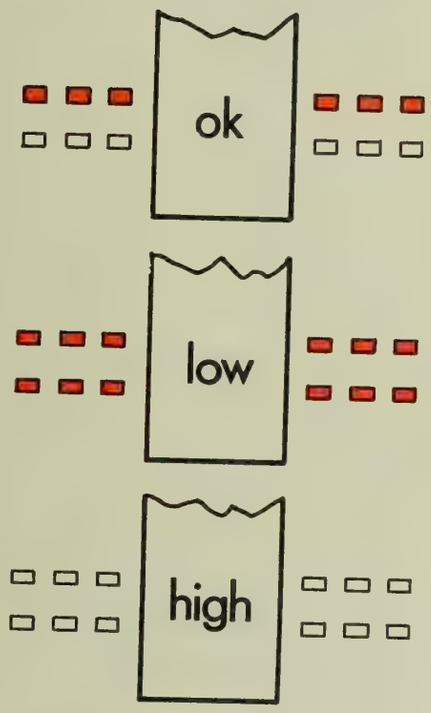
Dangerous? We don't really think so. After all, we are not equipped for CAT III (zero/zero) and are really in a bind for CAT II (100-¼) RVR 1200, so in effect you will have to break out and land your bird contact. If the present state of technology were such that everybody flew the glideslope to a landing on the spot where the glideslope intercepts—*then* there would be a



problem. As yet, unfortunately, the Air Force does not possess this kind of equipment (i.e., certified zero/zero).

So far, we've talked about those approaches where you get guidance from the ground in the form of ILS or GCA. How about the old fashioned method of "You bet your bird" on your eyeballs and throttle technique? Plain ole VFR traffic pattern. We won't even go into the marginal cases of "Maybe it's VFR" —just those where you're in clear weather day or night. Be it a rectangular or overhead pattern, all pilots face the same problems. The files are full of "It looked like I had it made until all of a sudden I ran into the patch of liftless air and landed short."

We know our eyes lie to us. We've seen this many times in those crazy stacks of blocks and diverging lines used to illustrate the point, and these visual deficiencies also exist when we are landing an aircraft. Awareness of this physical limitation and acceptance of the fact by the pilot *should* radically reduce the number of short landings. How? By pilots using all the aids available. There's no regulation that prohibits use of the ILS during a VFR approach, so why not use it? Just set the frequency and bring the instrument into your visual cross check. If you're two miles out from touch-



down and the glideslope is caged at the top of the instrument, *you're low*. Sure, we know you want to be low on the gage over the threshold but out there a couple of miles you can get an *instant* clue that you just might be setting yourself up for a short landing.

HOW ABOUT VASI? We know a few pilots use it and rely on it—not completely, but simply as an *aid* (as advertised). Rolling out on final from an overhead, or on a five mile straight in, two red bars means *low* on the glideslope (which in most cases coincides with the GCA and ILS slope). Sure, we know you'll depart from this slope for landing and see red on both bars over the threshold, but if you *were* on the slope at ¾ of a mile from touchdown, on proper airspeed, chances are you won't land short unless you plan to set up a much higher than normal descent rate for the remainder of the landing phase. It's the old story that "if you haven't tried it, don't knock it." Get familiar with VASI and you'll find it a valuable aid. *Axiom #3:* Use all aids available to you to minimize the danger of short landing.

Now let's review what we've said:

- Don't rely on what you *think* you see. Your eyes sometimes play tricks on you.
- Don't expect GCA or ILS to get you in position to land in the first 1500′ if flown to minimums of the runway. It isn't designed to do this. Don't duck under the glideslope. If conditions are so low you are *planning* to fly low on the final approach, maybe you ought to reconsider the operational requirement of the mission.
- Use *all* of the landing aids available. Don't just rely on "seat of the pants" flying. No extra charge for use of the ILS or VASI. ★


US AIR FORCE
US AIR FORCE
US AIR FORCE

the VICIOUS CIRCLE

Major David H. Hook, Canadian Armed Forces, F-101 Project Officer, Directorate of Aerospace Safety

"How'd the trip go, Sir? Any problems with ol' Bess?"

"Nah, Sarge. She's okay." The Lieutenant checked off the 781, waved a cheery goodbye, and sauntered over to discuss the flight with his wingman.

"Hey, man," greeted the latter, "that crate of yours was really bouncing around at first. You have some kind of problem taking off on my wing?"

"Yeh, I got stuck with 127 again, and it took me a few seconds to settle her down. Boy, is that beast sensitive in pitch! However, you probably noted how quickly the ace of the base subdued her girlish wiggles."

"Um-m-m, about five minutes, I'd say."

At this point the conversation drifts back to Topic A, and the participants pass beyond our hearing. However, the part we did hear should have had a familiar ring for many pilots because aircraft discrepancies are not being written up. Because of either complacency or a desire not to cause extra work, pilots learn to live with imperfect systems in their aircraft.

Such a situation constituted the background for the loss of an RF-101 last spring. Because the pilot was also lost, the history of the accident will always remain incomplete, but enough facts are available to substantiate a reasonable reconstruction of the events.

Shortly after leveling off at medium-altitude for an area cover photo mission, the pilot transmitted a "Mayday," stating that the aircraft had pitched up and he was punching out. Unfortunately, during the ejection sequence he was fatally injured in a collision with the ejection seat.

Investigators had only a few components of the flight control systems to examine, as most of the aircraft was destroyed by fire after impact. No discrepancies were found, so an intensive review of the maintenance records was made. Three flights earlier the Altitude Hold function of the autopilot had been written up as erratic, but on the next two flights neither pilot checked out the results of the repairs. Because the accident occurred at a point in space where the pilot is likely to have turned on the autopilot for the first time, a malfunction of the autopilot was strongly suspected.

However, further digging revealed more interesting facts. The aircraft had a history of oversensitive pitch control that extended over more than two years. Indeed, for a period of time the controls were so bad that the squadron prohibited the aircraft from making practice refueling missions. On at least one occasion a flight control team had been assigned to work on this aircraft. Both operations and maintenance supervisors were aware that this bird had a problem.

Even with this long history, no one seemed to be overly concerned. The aircraft was released for flight with the problem unresolved and everyone "keeping an eye on it." The crew chief who had the aircraft for the last two years of its existence, said that it continued to have problems with sensitive controls—both before and after the major overhaul which occurred a year before the accident. Eventually, pilots who flew the aircraft seldom bothered to write up the condition.

Investigation also revealed that a calibrated test G-meter was not available in the unit for performing functional check flights of the anti-pitch control system. Because the investigators were unable to determine when a G-meter was last used on an FCF, the integrity of the pitch control system on the last flight is uncertain.

This crash which cost the life of a very experienced pilot is only one of several that have resulted from a vicious circle of complacency. Because of crewroom stories, pilots conceive a distrust of a certain system in their aircraft; consequently, such systems are disused or their imperfect operation is tolerated; without write-ups and other indications of operator concern, maintenance personnel don't put a system into perfect shape; finally, one day the system is needed, it fails, and a new hairy tale is born to feed pilot distrust. Or an aircraft crashes!

Everyone of us can help to break this vicious circle. If pilots demand the best, maintenance will be proud to provide it. The only way to ensure that a system is reliable is to exercise it regularly, write up discrepancies accurately, and repair it conscientiously. It all depends on you, regardless of where you fit in the circle. ★

Wes Robinson
The Boeing Company

the sound of silence

PERHAPS FORTUNATELY, nature provided man with only limited hearing—roughly in the region of sound vibrating at frequencies between 16 cycles and 20,000 cycles per second. Thus man does not hear the rattle of air molecules bumping into each other in a breeze or the rumble of a growing tree. Yet there are such sounds, in fact a complex universe of sounds above and below man's range of hearing. It is a wonder more human eavesdropping has not taken place in these supposedly silent regions.

Work now under way in Boeing's aerospace laboratories clearly indicates that tuning in on this cacophony of silence may be of tremendous benefit to both man and machine. The Boeing work is the brainchild of Harvey Balderston, a research specialist in Boeing's failure analysis laboratory. Balderston reasoned that it might be possible to hear tiny mechanical defects if some way could be found to screen out unwanted noise.

By recording only extremely high frequencies and then slowing them down to the range of human hearing, Balderston *did* screen out unwanted noise. A bearing with only a tiny scratch on its surface sounds like a lively xylophone solo when recorded and played back at a slow speed. A worn hydraulic valve nearing failure sounds like a flushing toilet. Every operating part, according to Balderston, has its own unique, high-frequency beat, hiss or tinkle which changes as it wiggles and waggles and wears out.

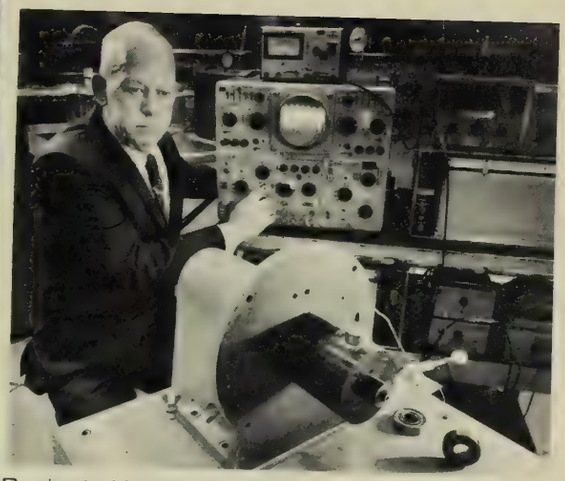
Balderston has listened to the sounds of life itself. He found that an artificial heart valve in a human patient had an acoustic pattern different from a real heart valve. His work with hydraulic fluid flow indicates there is a distinct possibility equipment may someday be developed to listen to the sound of blood flowing through a patient's body, much the way a doctor now listens to a heartbeat with a stethoscope.

At present, detecting these silent sounds requires expensive, bulky equipment. However, in 10 to 15 years when microelectronic designs are more fully developed, the failure detector could consist of 5000 circuit elements interconnected in a structure the size of an ice cube and sold for under $10.

A LIKELY EARLY USE of failure detectors would be to tune in on automobile problems. Relatively inexpensive equipment could be developed to attach briefly to a transmission, engine, or other automobile power equipment. The mechanic then could listen for indications of trouble. Auto makers already have shown interest in de-







Boeing's Harvey Balderston listens in on bearing failure.

Bearing, wired for sound, sings a worried song.

veloping this kind of diagnostic equipment.

Balderston is currently at the equipment - designing stage of his work, piecing together hardware that could detect the beginning stages of failure in structural, mechanical, hydraulic or electrical/electronic systems during normal operation. Balderston has discovered several important rules for listening to the silent sounds of failure in the course of his research: (1) all failures are either the result of structural defects or chemical contamination; (2) a defect in one part of a system sets everything in that system to vibrating, and (3) the energy level of the frequencies associated with a failing part is ten thousand to a million or more times higher than normal resonant frequencies. For example, the energy level of bubbles from leakage in a hydraulic valve near failure is an astronomical three billion times higher than the level in a good valve.

With these and a few other rules of thumb to go by, Balderston expects to perfect equipment that will quickly and automatically isolate trouble in aircraft and other mechanical systems long before there is any other indication of trouble. A programmed card would be inserted in the test equipment to check bearing surfaces, for example. All bearings could be checked at once, and a meter would indicate the relative amount of wear. More important, red-line emergency condition could be pre-set on the card, and if detected noise exceeded a certain level, a light would flash, indicating that one of the bearings should be replaced. As visualized by Balderston, the test equipment could be made small enough to be hand-held and, with a change only of the programmed card, one piece of equipment could be used to check any number of sys-

THE SOUND OF SILENCE CONTINUED

tems, whether mechanical, electrical or structural.

SOUNDS AUDIBLE TO MAN would not be required for checking most systems. But when the sounds of failure are brought into the range of human hearing, they provide dramatic evidence of the secrets being discovered. Especially surprising is the noise of crack-resistant metal trying to sew itself into a strong lattice-like structure to stop a crack from spreading. Slowed to human hearing range, this sound is a series of bell-like tinkles not unlike falling splinters of glass.

"It is the sound of molecules falling into stronger structural units," Balderston explained.

Perhaps the most spectacular proof of the new failure detection system came about quite by accident. Demonstrating his technique to a group of Boeing officials, Balderston set out to show how a deliberately damaged bearing registered a much higher resonant frequency than a new bearing. However, to Balderston's surprise, just the reverse happened. The new bearing had a higher frequency reading than the damaged bearing. Disassembly showed the new bearing had a deep gall across its face, a flaw actually more severe than that inflicted on the test bearing.

Such are the secrets whispered by the sounds of silence.

(Reprinted from BOEING Magazine) ★

alert

Useful tips from UEIs

Observations noted during Unit Effectiveness Inspections

Aircraft placed in hangar and **maintenance performed without removal of 20mm ammunition** in violation of TO 11A-1-33.

Power production personnel responsible for inspecting and maintaining barrier arresting systems were not authorized a radio for contacting the control tower. Consequently, **more time was lost in getting on the runway** due to poor communications than was spent in inspecting and maintaining the arresting systems.

Unit had no program to insure that personnel who entered the cockpit of assigned aircraft had received cockpit familiarization and/or egress system training.

LOX servicing deficiencies included lack of protective caps on LOX servicing hoses, some trailer tires were low, substitute forms used in lieu of AFTO 134 were not annotated to show which aircraft had been serviced, some safety equipment not available, there was no record of the last purge of oxygen flasks.

Simulated exercise indicated that **emergency procedures for evacuating pilots** from fighter aircraft by crash rescue and LBR firemen were unsatisfactory.

Review of aircraft records and lists of personnel authorized to clear Red X conditions indicated that **unauthorized persons were clearing Red Xs on assigned aircraft.** Red X authorization lists were published quarterly and frequently amended. Suggestion was that list be updated every 30 days and published in the monthly maintenance plan to insure dissemination to all maintenance supervisors.

Unsafe AGE practices: Two tractors with engines running were left unattended, one attached to a unit being refueled. An NF-2 generator engine was left running unattended in the AGE yard. The battery caps had been removed and electrolyte had corroded the battery compartment.

Inspection of the **Com/Nav shop revealed many discrepancies,** e.g., electrical grounding system serviceability questionable and not properly marked, high voltage signs not prominently displayed, emergency lights inoperable, first aid or safety board not available, work benches cluttered and floor dirty. ★

EGAD! EGRAS, THE ELEPHANT'S BROKE

A TRUE??? ACCOUNT OF AN HISTORIC INCIDENT



Willis C. Brenton,
CMSgt, USAF Ret.

Hannibal was leading his army into the low foothills of the Alps when it happened. The elephant he was riding buckled at the front gear and went tumbling down into a deep ravine. Hannibal attempted an emergency ejection, which was only partially successful, but at least he cleared the elephant enough to escape serious injury. It was pretty obvious, after the dust settled, that the elephant was damaged beyond economical repair. Hannibal summoned his crew chief over to his side.

"Egras," he said reluctantly, "get the head bowman over here and have him finish off this elephant." As Egras turned away Hannibal called out, "and have the EMCO (Elephant Maintenance Control Officer) report to me on the double!"

The EMCO came puffing up to the edge of the ravine and surveyed the carnage. It was a good thing it wasn't Hannibal's favorite elephant that had fallen. But from what he could see of Hannibal's face, it was going to be tough enough. By the time he climbed down to the elephant, Hannibal and Egras were already going over the Elephant Discrepancy scroll.

"No wonder!" Hannibal snarled, shaking the scroll under Egras' nose. "Look at this list of uncleared discrepancies! Elephant ears overdue inspection, right tusk sway brace loose, front knee locks out of adjustment. It's a wonder he made it this far!"

"But Sir," wailed Egras, "I'm in charge of your number one elephant. I just started crewing this one this morning."

"Well, you ought to be more careful; everyone of these write-ups is motion essential!"

"Yes Sir," Egras replied, "but this beast was just transferred in about a week or two ago. And the transferring unit is supposed to have it ready to go."

Since a crowd had gathered, Hannibal did not want to argue the matter further. He dismissed Egras with one of his famous Hannibalisms, "The best laid plans of men and elephants often go astray."

That night Hannibal called his Director of Elephant Maintenance and gave him orders to get to the bottom of things before morning.

Hannibal was up early and stood outside his tent watching the morning sun glance off the ice-encrusted peaks of the mountains towering over him. He could see Egras at the elephant parking line methodically going through the pre-motion scroll on his number one elephant. The boys in the Elephant Control Center had already snuffed out their lamps, abiding by his latest directive on saving oil, but across the way in the

EGAD! EGRAS, THE ELEPHANT'S BROKE

CONTINUED

operations tent several lamps still burned. Hannibal made a mental note of this violation. His survey of the camp was interrupted by the appearance of the DEM and the EMCO coming up the trail with a young pale-faced officer in tow.

After Hannibal and the officers had exchanged greetings, DEM reported.

"Well, Sir," he explained, "I think we pin-pointed the problem."



He dragged a young pale-faced officer forward. "This," he said triumphantly, "is the culprit. He's the new refueling officer and he used to be a supply officer, which explains everything."

"How does that explain anything?" Hannibal asked.

"Well, Sir, you know how supply officers like to hoard everything? Well, last week he was getting worried about the hay not lasting so he cut the elephants' rations way down. That elephant that gave out yesterday wasn't properly fueled."

Hannibal stepped forward and placed his hand on the trembling refueling officer's shoulder. "Is that right, son?" He said gently, "Did you cut down on the fuel loads?"

"Yes Sir, I did." The officer squeaked. "But only after I checked it out with operations and elephant control. They said it was O.K. by them."

"Did you check that out?" Hannibal asked the DEM.

The DEM squirmed. "No, Sir, I didn't think it was necessary."

"There you go with that thinking stuff again." Hannibal rasped. "Did you check any of those discrepancies on the elephant discrepancy scroll for the animal that fell yesterday?"

"No, Sir, I didn't."

"Well, tell me this. Did you look at all aspects of the problem and come up with a good sound reason for the elephant failure, or did you just jump on the first excuse you could find?"

The next man in line was the EMCO, and Hannibal turned on him. "Every one in the maintenance complex looks to you for guidance, and you're supposed to know the exact status of each and every elephant. What do you know about this reduction in fuel loads?"

Like most maintenance control officers, the EMCO started a detailed explanation of the situation based upon a rather vague personal knowledge.

"The reduction in fuel loads was based upon a protracted study of requirements and was sound and reasonable. We felt that the savings would make the politicians back home real happy. You know how they have been pushing this cost reduction bit?"

The reference to cost reduction hit a soft spot with Hannibal. The cost of campaigns was rising steadily and funding was critical. Still, letting expensive equipment sit idle because of penny savings was hardly practical.

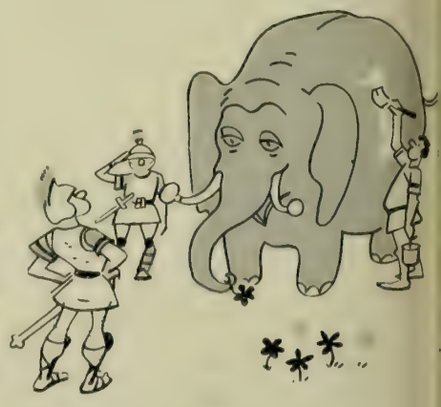
"One thing I must insist on," Hannibal told his EMCO, "this unit must be run efficiently, but the elephant in-commission rate must be maintained at 90 per cent."

"We're trying, Sir," the EMCO said, "but you know that Carthage wasn't built in a day."

Hannibal shot a quick glance at the EMCO; that sounded an awful lot like an Hannibalism.

The discussion went on for some time, but it turned out the same as always—accusations, counter-accusations, and nothing really solved. The same thing was going on in most of the staff meetings too, Hannibal remembered. He made a mental note to look into the necessity for so many meetings.

Hannibal left the group and went



over to his number one elephant. Egras was going through a few busy little tasks, which crew chiefs have devised to impress drivers.

"Egras, get Elephant Maintenance Control on the horn."

Egras picked up his calling trumpet and yelled Control's number. A tousled head appeared at the flap of the Control tent. Egras handed Hannibal the trumpet.

"I want to know the exact status of this number one elephant." Hannibal yelled.

The reply was prompt. "In commission and ready to amble, Sir."

"You had better be right!" Hannibal said.

Hannibal mounted the ladder to the elephant's control platform and picked up the operator's check scroll. He carefully checked off each item: platform lashings for security, ears for alignment, guide spots behind ears for sensitivity, platform jettison pins, right on down the line. He then slipped down the ladder and made his walk-around inspection. He kicked the right aft ear and got a quick kick right back. He smiled his approval.

Hannibal moved around to the front of the elephant and borrowed Egras' tusk testing hammer. He gave each tusk a sharp bang and each gave off a clear ring. Both ears were checked for wax, ticks and dirt and were O.K. Hannibal handed the scroll back to Egras.

"Well, he seems O.K., Chief," he said, "but I believe I'll take him out for a test."

Egras helped his boss up the ladder and helped him strap in, then he went forward and guided Hannibal on the stroll out. Hannibal lined the elephant up on the trail and eased on the power. Walk power checked good, and amble power was O.K. but when he went into fast shuffle there was a very definite power loss. Hannibal tried a turning abort and lost control on the downhill side of the trail. Once more he had the terrible experience of gear failure and roll over. The platform jettison pin hung momentarily and Hannibal just cleared the weight of the rolling elephant. As it was, he hit his head on a rock.

Hannibal came to his senses two days later and awoke to find the Director of Elephant Maintenance leaning over his bunk.



"We found the problem, Sir," the DEM said, trying to beat Hannibal to the punch. "It was feed contamination. Quality Control let a bad bunch of fuel get through. It was half thistles and the elephants just couldn't eat it."

"You sure that was it?" Hannibal moaned.

"Yes, Sir. We got the thistles out and the elephants are well fed and in good shape. Our problems are over."

"I *hope* our problems are over," said Hannibal, but he knew that something else would go wrong before long. He wondered if other commanders and other organizations had similar problems. He knew that his campaign was like a huge puzzle and each member of his army had a piece of it which had to be placed in a certain spot at a certain time. He also knew that a misplaced or missing part of the puzzle would effect the final solution. But how could he get his men to see it?

The only thing he could think of was another Hannibalism. "You see those mountains out there?" he said to his DEM. "Well, if we all work together and everyone does his job, we can make molehills out of those mountains." ★

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1969 Saf

Secretary of the Air Force Safety Trophy

PACIFIC AIR FORCES

Best overall accident prevention program of all major commands with a military strength of 15,000 or more personnel.

PACAF's accomplishments in accident prevention were truly outstanding. Despite the constant rotation of aircrews and support personnel, around-the-clock, all-weather missions flown in a hostile environment in congested air space and from austere facilities, the command reduced its aircraft accident rate by 12 per cent while flying 1.79 million hours. Similar adverse conditions on the ground were overcome and the Command continued improvement in the ground safety categories evaluated. These accomplishments reflect strong command interest, effective safety management and a high degree of motivation among all PACAF personnel.

AIR FORCE RESERVE

Best overall accident prevention program of all major commands with a military strength of less than 15,000 personnel.

The aggressive accident prevention program of the Air Force Reserve produced an outstanding record of no aircraft accidents, major or minor, while flying 150,000 hours during 1969. The wide scope and diversity of Reserve operations, which included 1769 overwater missions to many parts of the world, direct support of SEA operations and airlift support of special exercises and Army airborne training, make the Reserve record particularly outstanding. The success of the Air Force Reserve in preventing aircraft accidents attests to the high degree of professionalism and dedication throughout the command.

Koren Kolligian, Jr., Trophy

MAJOR HENRY M. DYCHES, JR.



The Koren Kolligian, Jr., Trophy is awarded to Major Henry M. Dyches, Jr., in recognition of his outstanding feat of airmanship while flying a WC-135B at Yokota Air Base, Japan, 7 July 1969. During takeoff roll, a mechanical failure caused the flight controls to bind so that, at rotation speed, the aircraft could not be rotated to takeoff attitude. With the use of only elevator trim control, a successful takeoff was accomplished at the runway overrun. By expertly utilizing available trim, differential spoilers, and throttle control, Major Dyches executed a successful emergency landing in minimum weather conditions, averting a major catastrophe that would have taken the lives of many civilians residing near the airfield.

Maj G… Memo…



AEROSPAC…

A new Co… success rate… flect the ou… sonnel at a… NORAD con… East, ADC's … dence outst…

S AIR FORCE

y Trophies

ief of Staff Individual Safety Trophy

oy J. Broughton, Jr.

Broughton as Director of Safety, produced an accident prevention at resulted in significant reduc- Command's accident rates. His nagement was largely respon- Command attaining a record accident rate for the second ear. The resultant saving of eriel contributed substantially t capability of the United e in Southeast Asia.

Lt Col John F. Fowler

Under Colonel Fowler's leadership for three years, the 21st Avionics Maintenance Squadron, Alaskan Air Command, maintained an accident and incident free record in missile, explosives and nuclear safety. Colonel Fowler contributed significantly to this record by applying his knowledge of missile systems to effect improved weapons system reliability and environmental safety despite the many missile handling operations in extremely adverse weather.

MSgt James A. Taylor

As Ground Safety Superintendent, Hq AFCS, Sergeant Taylor's outstanding devotion to duty and ability to initiate changes in the accident reporting and analyses procedures of AFCS resulted in substantial reductions to the command's accident rates and a savings of Air Force resources. Sergeant Taylor demonstrated an unyielding devotion to the development and implementation of safety programs within AFCS and the Air Force.

min D. Foulois

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MAND

ccident rate, 100 per cent ejection ttributed to maintenance factor re- alism and motivation of ADC per- sibility for providing forces to the nmitments in Alaska and the Far e particularly noteworthy and evi- pervision and effectiveness.

Colombian Trophy

10TH TACTICAL RECONNAISSANCE WING



The Colombian Trophy is awarded to the 10th Tactical Reconnaissance Wing, RAF Alconbury, United Kingdom, for meritorious achievement in flight safety during 1969. The wing attained one of the most outstanding safety records in the Air Force as well as noteworthy achievements in operations and mission accomplishment. During 1969, the wing flew over 15,000 hours and 7,680 sorties in the RF-4C without experiencing an aircraft accident. This achievement is extraordinary in that it sustained a record of excellence which spanned 32 months and 43,000 hours of accident free operations in the RF-4C.

Ops topics

SHORT BURSTS FOR OPERATORS



SALT INGESTION

The HH-3E was participating in a water survival training exercise and had made an overwater pick-up of 16 students. The aircraft then hovered at an altitude of approximately 5 to 10 feet above the water for 31 minutes while the students were redeployed into the water. As the aircraft entered a hover, 30-40 feet above the water to pick up another student, there was a series of loud bangs followed by engine power failure. The pilot attempted an autorotation landing while maneuvering to avoid the student in the water. The aircraft struck the water hard enough to break the fuselage skin. This allowed water to enter the aircraft causing it to sink.

A training mission profile had been established which, based on mission requirements, warnings, and limitations in the TP 1H-3(C)C-1, contained elements of a potential accident. In fact, two weeks prior to this accident an HH-3 flying on the same mission profile had a power loss and compressor stall as a result of salt ingestion. The incident report pointed out that the heaviest salt spray ingestion occurred while students were being deployed from the helicopter into the water. The report also stated that the operations officer was unsuccessful in negotiating a change to the mission profile, specifically to delete the low hover student redeployment. Although supervisory personnel and crewmembers had been briefed on the potential dangers associated with the mission profile, no positive action had been taken to eliminate the accident potential.

CPI INTERFERENCE

Results of a recent test to determine the extent to which a Crash Position Indicator would interfere with an emergency radio were sent to *Aerospace Safety* magazine by Lt Col Kenneth Ablett, Aircrew Standardization Officer at Hq 21st Air Force, MAC, and are passed on for your information. The test was conducted by Sgt Charles H. Hawkins, survival instructor in the 438th Air Base Group at McGuire AFB.

Sgt Hawkins and two other men removed the CPI from an aircraft and activated it. While standing within five feet of the CPI, Sgt Hawkins attempted to contact Approach Control with an RT-10 emergency radio. The two other men were stationed 50 to 75 feet away with URC-10 radios. They and Approach Con-

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trol could hear Sgt Hawkins. The two men could hear Approach Control reply but Sgt Hawkins could not.

The conclusions were that reception by the emergency radio would be blocked by the CPI unless they are separated by at least 50 feet. A minimum of 100 feet is recommended.

FLIP CHANGE

Effective with the 25 June 1970 issues of U.S. FLIP Enroute Charts, the high and low altitude airway structures in the New York Terminal Area will be completely revised in accordance with the FAA Metroplex Plan. The specific charts effected are Low Altitude Charts 24, 25 and 28 and High Altitude Chart H-3. See Special Notices in FLIP IFR Supplement—U.S., 28 May 70 and FLIP Planning Section II, 25 June 70. ★



FEATHERED FRIENDS?

A birdstrike again emphasizes the importance of keeping your visor down. During a night qualification flight in a T-38, the front seat pilot informed the IP that they had taken some birdstrikes. Engine compressor stalls and high EGT followed immediately. Since they were at 400 to 500 feet climbing after takeoff, the IP ordered ejection. The ejections were successful but the IP in the rear received facial burns from the front seat rocket catapult when the center blast screen failed. The IP did not have his visor down.

F-105 GEAR UP

After a tactical night mission, the *Thud* was passed from enroute to approach control radar. Everything progressed normally until touchdown. Configuration at landing was 650 gallons centerline, one 450-gallon fuel tank, one AGM-78A inboard, an AGM-45 on each outboard station, and GEAR UP.

After a 5000-foot slide, both crewmembers successfully evacuated the burning aircraft. Shortly thereafter, one of the missiles exploded in a low order detonation followed by some smaller explosions. During the rescue operation an H-43B's windshield was damaged by fragments from the exploding missiles.

SECOND TIME AROUND

Taxiing out for takeoff, a C-123 pilot managed to rake his wingtip on a 20 foot high machine gun tower. The tower is located 34 feet from the edge of the taxiway. The incident occurred while the pilot was swinging the aircraft to the left for a right turn into the wind for run-up. He was downgraded to copilot until he demonstrates his professional qualifications. A recommendation has been made to the base commander to move the obstacle. This was the second aircraft to skin a wing tip on the same bunker. ★

REX RILEY'S CROSS COUNTRY NOTES

REX RECOMMENDS. I have received several inquiries concerning the length of time that our "Recommended" bases have remained on the select list. It is a difficult question to answer directly without reflecting unfairly upon the continued high quality of transient services provided by certain bases that have been removed through no fault of their own.

Loring AFB, awarded the Rex certificate in March 1958, has maintained its original position on the list longer than any other. The Arkansas Air National Guard Base at Little Rock held that honor until April 1964, when the new TM Standard allocations required the Guard bases to withdraw from the competition. In fact, that base and Hill AFB were the first two bases to grace this page when the program was initiated in February 1958.

To date, my files reflect a total of 91 placements and reinstatements, including 16 incumbents removed and reinstated since the program began. And, to show that perseverance pays, an even dozen of the 45 bases currently listed are on for their second time, while four have been on the list three times.



CANADIAN TRANSIENTS

Training Command of the Canadian Armed Forces has begun a transient services award program similar to our Rex Riley Transient Services program. After six months of operation, it is considered to be highly successful as indicated by response from transient aircrews.

During the first three months more than 500 comments had been received from aircrews, evaluating the service they received from transient facilities. Most comments were complimentary but some offered constructive criticism, ". . . the only kind acceptable in this program," according to the Canadians.

USAF aircrews transiting Canadian Training Command bases are invited to comment on the quality of transient services on forms available at the bases. Already some USAF crews have participated. By the time this magazine gets to the field the Commander, Training Command will have awarded commendation certificates to base sections that have received high evaluations. If you visit a Canadian base you can tell which sections have made the list by the symbol shown above.



REX RILEY

Transient Services Awa

LORING AFB	Limestone, Me.
McCLELLAN AFB	Sacramento, Calif.
MAXWELL AFB	Montgomery, Ala.
HAMILTON AFB	Ignacio, Calif.
SCOTT AFB	Belleville, Ill.
RAMEY AFB	Puerto Rico
McCHORD AFB	Tacoma, Wash.
MYRTLE BEACH AFB	Myrtle Beach, S.C.
EGLIN AFB	Valparaiso, Fla.
FORBES AFB	Topeka, Kans.
MATHER AFB	Sacramento, Calif.
LAJES FIELD	Azores
SHEPPARD AFB	Wichita Falls, Tex
MARCH AFB	Riverside, Calif.
GRISSOM AFB	Peru, Ind.
PERRIN AFB	Sherman, Tex.
CANNON AFB	Clovis, N.M.
HICKAM AFB	Hawaii
LUKE AFB	Phoenix, Ariz.
RANDOLPH AFB	San Antonio, Tex.
ROBINS AFB	Warner Robins, G
TINKER AFB	Oklahoma City, O
WETHERSFIELD AFB	England
HILL AFB	Ogden, Utah
YOKOTA AB	Japan
SEYMOUR JOHNSON AFB	Goldsboro, N.C.
ENGLAND AFB	Alexandria, La.
MISAWA AB	Japan
KADENA AB	Okinawa
ELMENDORF AFB	Alaska
PETERSON FIELD	Colorado Springs
RAMSTEIN AB	Germany
SHAW AFB	Sumter, S.C.
LITTLE ROCK AFB	Jacksonville, Ark
TORREJON AB	Spain
TYNDALL AFB	Panama City, Fl
OFFUTT AFB	Omaha, Nebr.
ITAZUKE AB	Japan
ANDREWS AFB	Washington, D.C
McCONNELL AFB	Wichita, Kans.
NORTON AFB	San Bernardino,
BARKSDALE AFB	Shreveport, La.
HOMESTEAD AFB	Homestead, Fla.

weather observation changes



CMSgt Sam Parrish, Hq AWS, Chief Observer

Air Weather Service has made several changes in observing procedures that will appear in teletypewriter sequences. Those of interest to aircrews are listed below.

• Unknown heights of cirriform cloud layers will no longer be reported as "/" or "U". When a reliable method of determining the height is unavailable, the height will be estimated (E), including those based on persistency (formerly "D").

• Sleet and small hail will be reported as ice pellets (IP) or ice pellet showers (IPW).

• The term "air discharge" (CA) has been added as a type of lightning. CA is defined as "streaks of lightning which pass from a cloud to the air but do not strike the ground."

• Several contractions for cloud types are changed: CBMAM (Cumulonimbus Mammatus), ACCAS (Altocumulus Castellanus), CUFRA (Cumulus Fractus), STFRA (Stratus Fractus).

• Light and variable winds are defined (speed is six knots or less and direction fluctuates by 30 degrees or more during the period of observation). When speed is greater than six knots, variable direction is reported as in the following example: WND 270V310.

• At bases which report runway visibility (RVV), the value will be based on the current high intensity runway light setting rather than the highest available.

• Peak wind gust data will no longer be reported as a part of tornado, thunderstorm and hail remarks. A separate remark will be used to report peak wind speeds observed in the preceding hour; e.g., "MAX GSTS 1723 2743" to indicate time of occurrence (1723Z) and direction and speed (270° at 43 knots).

• Estimated wind data will be reported with the "E" preceding the direction rather than following the speed.

• The peak speeds of gusts and squalls are reported in an observation for those occurring within the past 10 minutes rather than the past 15 minutes.

• To report a "Wind Shift" the wind direction must change during the last 15 minutes, by at least 45°. ★

Site Seeing

Hy Bosch, Directorate of Aerospace Safety





Explosives Clear Zones require thorough planning

The runway on an air base is the axis of a thriving hub of activity. No one would consider constructing facilities that would block passage to or from the runway, for it is the focal point of the base's mission. Encroachment on the clear zone around the runway will reduce the base's usefulness.

A similar clear zone is required around any explosives storage area. Explosives, by nature, constitute a threat and hazard to personnel, equipment, and facilities. Thus quantity-distance tables have been established, to minimize damage from explosives to inhabited buildings and vital airbase support areas. As a minimum, the distance from explosives storage sites out to the first inhabited building (explosives clear zone) must be kept free of new construction.

Infringe on this clear zone and you unduly risk disaster in the event of an accident. An alternative would be to reduce the amount of explosives that may be stored in munitions facilities. But this would limit the base's explosives storage capacity to less than it was originally designed for. A change of mission requiring increased quantities of explosives ordnance could not be handled without costly land acquisition and construction outlays.

Surprisingly enough, although the above facts are well known, bases sometimes plan for construction within the explosives clear zone. To forestall such shortsightedness, all plans for construction of new munitions facilities, modification of existing facilities or construction of unrelated facilities within explosives clear zones must be submitted through channels for approval. These plans are closely scrutinized at all levels to insure that engineering and safety criteria are met.

Procedures for submitting prescribed data that must accompany site plans are detailed in Chapter 8, AFM 127-100. While the established procedures are usually followed, there are still a few rugged individualists who prefer doing things their own way.

For example, a map or drawing of not less than 1":400' scale is required to properly identify the proposed location of new facilities in relation to other base facilities. Instead of this, some installations provide a 5 x 7 or 8 x 10 cutout of a map. Since explosives clear zones can extend to 5410 feet, a large area of the base could be left to the imagination.

The map must also show the base boundary and land outside the base over which restrictive easement or agreement has been obtained. This again is to insure that no unauthorized facility would be built within the clear zone. That, too, is why all buildings within the clear zone surrounding a new facility must be identified. It's amazing how many seemingly insignificant buildings within this area become habitats for boy scouts, thrift shops, hobby shops, gun clubs, golf shops and other sundry activities. Visiting areas sprout up near combat crew alert areas. Of necessity, alert force areas are in proximity to explosives loaded aircraft. Putting the crew's families in this same area is just not reasonable.

Once you've established your explosives clear zone, show it on the base master plan. Then treat that area as no-man's-land for future construction of other than explosives facilities.

Clear zone violations can be prevented at numbered Air Force or Command level during review of site plans. Some bases have seen fit not to chance this likelihood. They serenely construct the facilities without such review and then submit for post completion approval. Later, it is discovered that the munitions area fence is out of bounds for the 6th hole, or a children's slide is within a few hundred feet of a combat loaded aircraft. The alternatives then are: Abandon the unauthorized facilities; assume the risk through Command waiver action; or reduce the quantity of explosives to levels below that originally authorized. Good site planning would have obviated the necessity to face such alternatives. ★



A typical nuclear excavation test at the Nevada Test Site.

Radiation Safety *in* Underground Nuclear Testing

Capt L. G. Kline, Radiation Safety Officer, Kirtland AFB, NM

Gathering photographic, radiological and overpressure data from a thermonuclear detonation

HOW WOULD YOU HANDLE a radiological decontamination problem involving 25 aircraft and 200 personnel? Management of such unusual problems has been intensively practiced by specialized personnel at the Air Force Special Weapons Center (AFSWC) at Kirtland AFB, New Mexico. The following is an example of an operation of this kind.

PROJECT SCHOONER

Project SCHOONER, one of a series of nuclear excavation experiments, was conducted on 8 December 1968 at the Atomic Energy Commission's (AEC) Nevada Test Site (NTS), located approximately 60 miles northwest of Las Vegas, Nevada. The experiment involved the detonation of a 35KT thermonuclear device buried at a depth of 350 feet. The resulting crater was 800 feet in diameter and 270 feet deep. The dirt cloud rose to a height of 15,000 feet. The overall mission of the participating aircraft was to obtain photographic, radiological and overpressure data concerning the detonation and the cloud.

The Continental Test Division of the Directorate of Nuclear Field Operations, Headquarters, AFSWC, worked closely with the AEC and the Lawrence Radiation Laboratory (LRL) in planning for the required air support. As Radiological Safety (Rad-Safe) Officer for the Continental Test Division, the author planned for and supervised the Rad-Safe operations for the Air Force. Due to the nature of the test, radiological safety was of prime concern. Much activity on and off the NTS was dedicated to ensuring that personnel, animals and crops were not unnecessarily exposed to the hazards of radiation. Radiological safety procedures were spelled out in the Safety Annex of the Air Force Systems Command Operations Plan 15-66, "Air Force Continental Nuclear Test Support." Personnel and materiel support came from the Reynolds Engineering and Electrical Company (REECo), the AEC contractor at the NTS; Nellis AFB, Nevada; Indian Springs Air Force Auxiliary Field (ISAFAF), Nevada; and Kirtland AFB, New Mexico.

Although several Air Force commands participated, the RB-57C and 57F cloud-sampling aircraft of the 58th Weather Reconnaissance Squadron, Kirtland AFB, were the heart of the support. Their mission was to penetrate the dirt cloud in order to obtain particulate and gaseous samples. In line with good health physics practices and in order to insure that crews would not exceed the permissible occupational radiation exposure limit, they wore anticontamination clothing and used



CREW RECOVERY. The crew of an RB-57C is shown climbing into a forklift-mounted box. Care is taken not to touch the contaminated aircraft exterior.

Radiation Safety *in* Underground Nuclear Testing CONTINUED

100 per cent oxygen during the mission. Aircraft ventilation systems were shut off prior to cloud entry and remainder of the mission. The maximum exposure received by the aircrews was 290mR, well within the limits. Radiation was from sources of such short half-life that it presented no danger to the surrounding area.

Other aircraft which participated in the support mission were:

- An EC-121 used for airborne aircraft control;
- RC-130 and RC-118s used for photography;
- C-130s for sample package drops;
- UH-1Fs which performed security sweeps, search and recovery missions; and,
- A U-3B which performed the U.S. Public Health Service cloud tracking mission. None of their missions required cloud penetration; therefore, the following discussion will focus on the cloud-sampling aircraft recovery operations.

Seventy persons worked to recover the RB-57 cloud-sampling aircraft. Some personnel performed such tasks as crew, aircraft and sample recovery. Others assisted in monitoring, decontaminating and processing all personnel through the "hot line" at the personnel decontamination facility.

Equipment for Rad-Safe activities, mostly obtained through REECo, included E-500B and PAC-3G radiac instruments, film badges, pocket dosimeters, and anticontamination clothing, respiratory masks, general cleaning equipment, decontamination trucks, restraining devices to mark off the decontamination areas and walkie-talkies for communications.



SAMPLE RECOVERY. Two members of the Sample Recovery Team pull the sample "flimsy" from the wing-tip sampling tank. Note the use of long-handled tools to keep the individual at a distance from the radioactive source.

Once the participating personnel and aircraft were present at ISAFAF, Rad-Safe procedure briefings were held. Two full-scale mission rehearsals were held prior to the actual test.

After several delays due to weather, the final countdown proceeded normally. Soon the giant dust cloud was seen over the intervening mountains. Last-minute checks were made to insure that all equipment was ready, and recovery personnel were properly film badged and dressed in anticontamination clothing.

AS THE FIRST OF THE RB-57S taxied to a stop inside Decontamination Area 1, the Aircraft Recovery Team pinned and chocked the wheels of the aircraft, engines were shut down and the Crew Recovery Team removed both crew members and transported them to the personnel decontamination facility.

Meanwhile a monitor team spot-checked the aircraft to determine the levels of radioactivity present. Special attention was given to the wing leading edges and the wing-tip sample tanks. Readings of 500 to 1000m^{R}/hr (beta gamma) were obtained on these surfaces. These readings were radioed to the Rad-Safe Control Center. From the control center, the Rad-Safe Officer coordinated the activities of the various recovery teams within the controlled areas.

The Sample Recovery Team removed the particulate samples from the wing-tip tanks and the gas-sample bottles from the modified wing gun bays.

The particulate samples were collected on a special filter paper held inside the sampling tank by a "flimsy" metal screen. After removing each paper from the sampling tank,

with its "flimsy," it was placed inside a three-inch thick lead "cave," where the "flimsy" was opened and the paper rolled into a lead "pig." The "pigs" were then crated and shipped to the laboratory, but they did not require special handling preparations.

Eight RB-57 aircraft and their samples were recovered throughout the day. Recovery of each required approximately 30 minutes after each landing.

After the C-130 package-drop aircraft had taxied to a halt in Decontamination Area 3, a pickup truck transported the crews to the decontamination facility while a monitor team checked the aircraft for radiation levels and radioed the information to the Rad-Safe Control Center.

As the aircrews arrived at the decontamination facility they were monitored and decontaminated, as necessary. A standard "hot line" was used for monitoring—showers were available. Only seven of the 200 personnel in the operation required decontamination. These cases were minor ones which involved only the hands and hair. Use of anticontamination clothing and good health physics' practices accounted for the low incidence of contamination.

Most of the aircraft recovered throughout the day showed no traces of radioactivity and were released from the decontamination areas within an hour after recovery. The contaminated RB-57 aircraft were not released immediately, but were allowed to undergo natural radioactive decay. Readings taken on the day after the test were approximately one-fourth of those taken the day before. This natural decay rate was a great help in subsequent decontamination operations.

Cleaning procedures outlined in Technical Order 1-1-1, "Cleaning of Aerospace Equipment," were used. Personnel wore anticontamination clothing and respiratory protection equipment and adhered to strict hygienic practices.

Decontamination of the RB-57 aircraft began early in the morning following the test. The aircraft were towed to the decontamination pad where personnel and equipment were all readied and in position. Two teams of 10 men each were assigned to wash each aircraft, thus permitting continuous operation of the wash pad during the day. A full day's work was required to wash the aircraft. The area was decontaminated before it was opened to unrestricted access. Within two weeks the decay rate had reduced the radioactivity to background. Laboratory checks of the sewage effluent and the surrounding terrain were made to insure that the maximum permissible concentration levels were not exceeded.

The situation was controlled much like a Disaster Preparedness Team controls a BROKEN ARROW. A control center directed all activity within the restricted area. Entry to, and exit from, the area was strictly controlled. Each aircraft, regardless of its airborne mission, was treated as a real radiation hazard until thorough monitoring proved otherwise. Only after the area was completely free from radiation hazards, was it open to unrestricted access.

The Project SCHOONER Rad-Safe operation was completed efficiently and without any major incidents. From its inception, planning had proceeded under the assumption that the worst possible situation could develop. ★



DECONTAMINATION. The most effective means of decontamination is the use of soapy water. Solvent is used to cut through grease and oil deposits.

UNITED STATES AIR FORCE

WELL DONE AWARD

Presented for outstanding airmanship and professional performance during a hazardous situation and for a significant contribution to the United States Air Force Accident Prevention Program.



Standing (l to r)

Major Harold K. Sacane
Navigator

TSgt Bruce P. Huff
Flight Engineer

TSgt Billy R. Hales
Loadmaster

Kneeling (l to r)

Captain Donald R. Miller
Pilot

Major Thomas J. Lewin
Aircraft Commander

17th Tactical Airlift Sq, APO Seattle 98742

On 27 May 1969, Major Lewin and his C-130 crew were enroute to Sondrestrom Air Base after completing a resupply mission to a radar site on the Greenland Ice Cap. Captain Miller, the pilot occupying the left seat, leveled the ski-equipped C-130D at 16,000 feet and began accelerating to cruise airspeed. As the airspeed passed 200 knots, the crew heard three rapid explosions and the aircraft began vibrating violently. Cabin pressurization was lost and indicated airspeed decreased rapidly. TSgt Huff, the flight engineer, reported failure of Nr 1 and Nr 2 engines just as TSgt Hales, the loadmaster, reported Nr 2 propeller had torn a hole in the left side of the fuselage. The two engines were shut down, and with both pilots on the flight controls, a descent was begun. Maximum power on Nr 3 and Nr 4 engines was necessary to maintain control of the aircraft.

Sgt Huff reported Nr 1 and Nr 2 propellers had separated, one was embedded in the leading edge of the wing, and there was a large hole in the le side of the fuselage.

The crew quickly analyzed the situation and d cided they would attempt a forced landing on th ice cap. Major Sacane, the navigator, compute their exact position then, using the radio altimete began calling off the absolute altitude above th snow as Captain Miller continued the descent. Maj Lewin lowered the gear and skis and Captain Mill accomplished a smooth touchdown on the right ma ski and gently lowered the left ski to the snow. Ho ever, the ski and gear assembly had been damage and collapsed as the aircraft decelerated. Capta Miller kept the aircraft from ground looping by ski ful control of Nr 3 and 4 engines.

The outstanding ability, composure, and coordin tion demonstrated by Major Lewin and crew duri their handling of this extreme emergency prevent injury and the loss of a valuable USAF aircraft.
WELL DONE! ★

Toots

is interested in your problems. She spends her time researching questions about Tech Orders and directives. Write her c/o Editor (AFIAS-E1), Dep IG for Insp & Safety, Norton AFB CA 92409



Dear Toots

Major Johnson's Foreign Object Removal Program has the type of ideas that we are looking for in the Foreign Object Damage program (February Aerospace Maintenance Safety). Hope your readers can furnish similarly good ideas to their base and major command representatives. As a matter of interest, the "piece of junk" that Major Johnson referred to was worth about $11,000 during CY 69 ($13,531,600 repair dollars ÷ 1220 engine removals). Pretty expensive junk, not to mention some "stark terror moments" which make the flying game pretty sporty at times.

Lt Col. John P. Raymer
HQ USAF (AFSMEMS)

Dear Toots

As a maintenance technician I find your magazine very helpful.

Is there any way I can get a copy before it has passed through 14 sets of grubby, greasy hands?

A1C Endoftheline

Dear Endof

Thanks for the nice words; it's sure good to feel wanted!

About those grubby hands, I hope that each copy of the magazine reaches ten people. So there should be only ***nine*** *sets of grubby, greasy hands on it before you see it. If 14 fellas have handled one copy when it gets to you, maybe too many copies are being shortstopped before they get to the greasy-hand group. Why not show this to your local Safety Person—tell him I asked that he take another look at the distribution.*

Toots

Dear Toots

We have recently been ordered to remove the safety pins from the pintle hooks installed on all Aerospace Ground Equipment assigned to our organization. The reason given was that AGE does not meet the definition of vehicles as referred to in TO 36-1-44. We maintain that the safety pin should be on all pintle hooks installed for the purpose of towing.

We have also been ordered to remove the inventory labels attached to all AGE on our account. This is contrary to AFM 67-1, Vol II, Part II, Chapter 12, para 48B. May we have your comments, please?

FRUSTRATED SHOP

Dear Frus

From what I read in TO 36-1-44, you are right—the pin is required in all pintle hooks. I called the OPR, Warner-Robins AMA, and they agree; pintle hooks are supposed to have a pin for additional safety, regardless of what the pintle hook is installed on.

Regarding the inventory labels, possibly your supervisors are having the labels removed because they have a tendency to peel off. Removal of the labels is legal so long as AFM 67-1, Vol II, Part II, Chapter 12, para 52E is followed. Since there appears to be some misunderstanding, why don't you talk to your supervisor again?

Toots

Tech topics

BRIEFS FOR MAINTENANCE TECHS



doctor/detective

MAINTENANCE BOO-BOOS quickly get a lot of attention, whereas the hard work and effort of the boo-boo fixer is pretty much taken for granted. And fixing some of the things that go wrong with airplanes isn't easy. We sometimes think a good troubleshooter has to be a hybrid of about 50 per cent technician and 50 per cent Sherlock Holmes. To wit: An A-7 pilot got a compressor stall on takeoff just as the gear was retracting. He turned to downwind and dumped wing fuel, then tried to increase power. Another compressor stall. At 80 per cent the engine ran smoothly and an uneventful landing followed. Then the troubleshooters went to work. They removed the engine, borescoped it, ran it on a test stand. No results. Next morning they ran it again, simulating as closely as possible the conditions that prevailed when the compressor stall occurred. Mild to heavy stalls between 85 and 89 per cent. Further inspection and the inlet guide vane stop was found out of limits. The stop was set and the engine ran normally on the stand and during an FCF. Just another job well done by the maintenance crew. ★

unhooked hundred

ON POST STRIKE inspection, Flig
Lead saw that his wingman's
main gear door was missing. Win
had reached about 500 knots duri
the strike and pulled 5.5G on
pullout. After landing, QC det
mined that the gear fairing ro
had been contacting the fairing d
up-lock near the point of the ho

A peek at the back surface of
hook revealed that the hook
closed without catching the ro
In other words, the outer fai
door was out of adjustment. W
those paint marks on the fai
door up-lock hooks on preflight

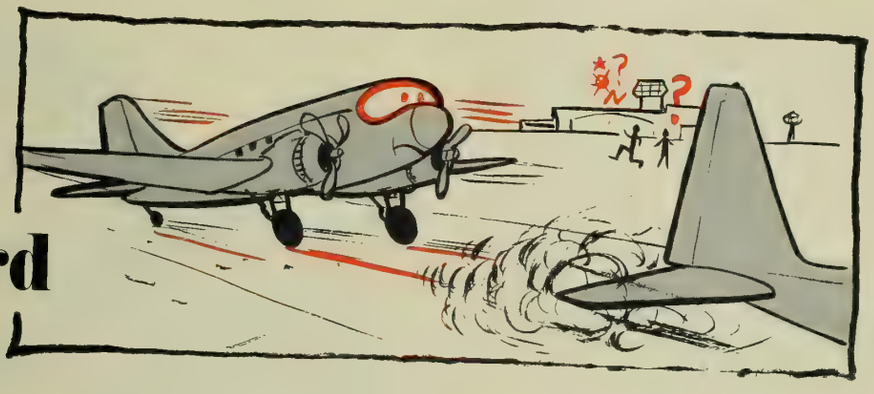
Daedalian trophy winner



FOR MAINTENANCE Excellence in 1969, the 4780th Air Defense Wing, Perrin AFB, Texas, is the winner of the Major General Clements McMullen Weapon System Maintenance Trophy awarded by the Order of Daedalians. Presentation was made during the Daedalians' annual meeting at Lackland AFB, Texas.

Receiving the trophy from Gen Jack Merrell, R, are Chief MSgt George Beleele, Col Jimmie Nichols and Col Vermont Garrison, Commander of the 4780 ADW. ★

blowhard



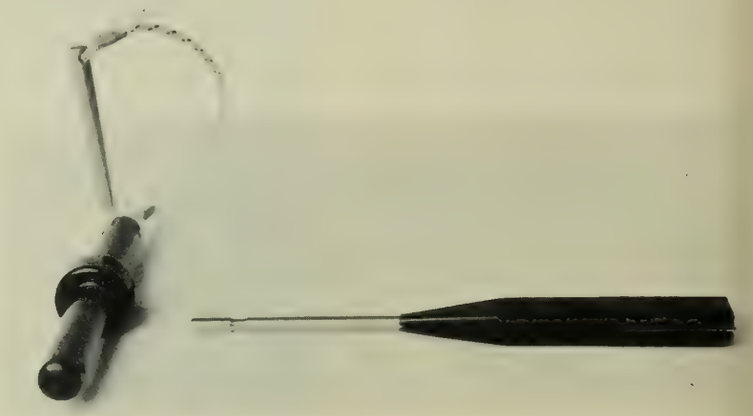
A C-47 WAS BLOWN almost 1000 feet ross the ramp, striking two RB-7s in its travel. The tie-down rope one wing broke and the tie-down ach point was pulled out of e other wing which allowed the aircraft to start its unscheduled movement.

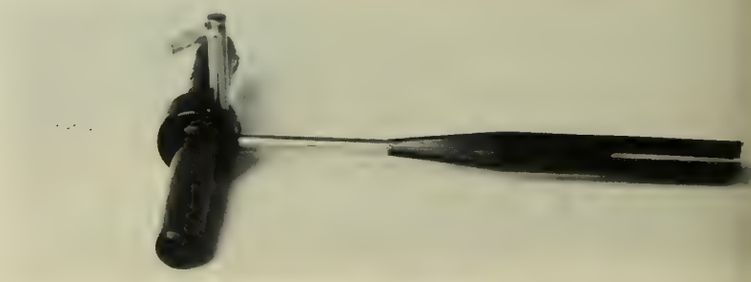
This minor non-flight accident occurred when the engines of a C-130 were being run at full power 230 yards ahead of the C-47. The propeller wake combined with 20 knot winds caused the C-47 to break from its moorings and roll backwards across the ramp, striking the two B-57s. ★

Maj John P. Garbe
Directorate of Aerospace Safety

Tech topics

CONTINUED





handy tool for p.e.

TOOL USED FOR INSERTING communication cord in the smoke mask. Tool can also be used for inserting cable guides in oxygen masks. OCAMA has procured 1000 of these tools (P/N 520-615, FSN 5120-NDO-29044HTP) for issue of one to each P. E. shop. On receipt, the tool should be placed in the field repair kit (mask, oxygen breathing) P/N 450-50, FSN 1660-672-3945.



F-105 loose connector

A RECENT F-105D incident brought to attention the fact that an unsafe right gear indication can be caused by a loose Bendix quick disconnect electrical connector plug, J326, located in the right main landing gear well. Of perhaps greater significance, however, is the fact that this connector also carries anti-skid and landing flap position indicating circuits. Therefore, all F-105 pilots should know that with an unsafe right gear indication, the anti-skid system and flap indicators may be inoperative. Said connector plug being loose, unsecured or improperly mated may also require the use of the override switch to raise the gear. *Maintenance and preflight personnel must assure proper locking of J326 quick disconnect electrical plug in right wheel well.* ★

(Submitted by AFLC)

AIM-4D damage

AN F-4E WAS BEING set up on alert with AIM-7s and 4Ds. The crew chief had connected a ground wire, with an alligator clamp attached, to a grounding point on the main gear. This allows the ground wire to disconnect on scramble. Then he yanked the ground plug from the aircraft ground point located on the right side about 3-4 feet from the exposed AIM-4 missile dome.

Result—broken dome. Now, nobody can work on alert aircraft without covers on the AIM-4 domes. ★



MIKE FOD



THE NOT-SO-CUTE FELLOW shown above represents micron-sized contaminants in aircraft hydraulic systems. "Mike" has been with us for a long time so maybe it is appropriate to formally introduce him. The idea for "Mike" came from the Canadian Forces who were more than glad to let us borrow him. He thrives on poor housekeeping and poor procedures, and the short cut is his breeding ground. Since 40 microns is about the smallest particle the eye can see, "Mike" is indeed a formidable adversary.

What is the size of this problem we are talking about? Control actuators and pumps of high performance aircraft have clearances as small as .0005 in. Aircraft hydraulic system filters are generally rated 25 micron minimal—15 micron absolute. Which means the filter is only about 95 per cent effective down to 15 microns—.0006 in. Several particles this size won't cause a system to fail but if too many accumulate they will cause a valve to stick or they might clog an orifice resulting in a very sick bird or worse.

"Mike" can be controlled, and the hydraulic shop is a good place to start. Super clean is the word.

Use dust caps on open hydraulic lines and disconnects.

Don't store hydraulic fluid in open cans or service directly from the can.

"Mike" can be controlled and the supervisor is the key to controlling him. Be sure your hydraulic system procedures reflect the discipline required. ★



SEMICONDUCTOR DO'S & DONT'S

Murvel Borth, Naval Aviation Engineering Service Unit

If semiconductors, vital to the operation of electronics equipment, are not to be damaged, they must be handled with care. Careful handling, use and servicing will prevent the incidence and severity of physical, mechanical and electrical abuses such as overheating, shock, lead-bending, damaging effects of ultrasonic cleaning, improper use of measuring equipment and improper handling. These abuses and ways of avoiding them are discussed in the following sections.

OVERHEATING

Because a transistor being serviced may be destroyed if its maximum junction temperature is exceeded, maintenance personnel must know this temperature and the melting points of other materials with which it may be used. For instance, the melting point of 60/40 solder (see table, Page 40) is 372 degrees F and that of the germanium transistor junction 212 degrees F. If the maximum junction temperature of the germanium transistor is exceeded during soldering, overheating may cause a shorted transistor junction, open lead connections, and the possible breaking of the hermetic seal (a result of uneven expansion between the header and the package).



Three hands are not an absolute necessity but it makes soldering with a shunt much easier.

To prevent damage to semiconductors, some of the precautionary maintenance steps that must be considered and taken are:

• DO remove the transistor from he socket to which heat is being pplied, if possible. Heat can quickly ravel from connecting wires being erviced to produce negative effects n neighboring circuitry.

• DO use an adequate soldering ron — one that will supply only nough heat to get the job done. Most work can be accomplished by se of an iron in the 20- to 50-watt ange.)

• DON'T use higher-tempera- re-rated soldering irons unless an nergency exists. Their use increas- the risk of damage to the device.

• DO use heat shunts (clips, iers) to isolate the transistor from e heat source.

• DO clean all surfaces to be ldered, and solder all wires clean- and quickly.

• DO remove any flux residue lead connections with alcohol other approved noncorrosive lvent.

SHOCK

Since semiconductor materials are rd, brittle, and sensitive to physi- vibrations, personnel handling m improperly can cause mechani- damage resulting from heat-im- ct shock. Therefore—

• DON'T drop a transistor onto a wooden work bench.

• DON'T shock-abuse vital and sensitive transistors in handling.

LEAD-BENDING

Most maintenance personnel know that sharply bending wire leads back and forth in conventional circuitry results in a break, or at least a fracture. This is especially true of transistor wire leads, which are located at the entrance of the header area. If bent during testing their service life is considerably shortened and cracks may be produced at the header through which moisture may enter and contaminate the device. To insure against the foregoing:

• DO remember to allow at least one-eighth of an inch clearance between the header and the start of the band to the lead of the transistor.

• DO avoid sharp bends and preserve future components for readiness of equipment operation.

ULTRASONIC CLEANING

Semiconductors should not be cleaned by ultrasonic means. Therefore—

• DON'T place transistors and diodes in an ultrasonic cleaner. Although some semiconductors can withstand the level of vibration encountered in such a cleaning unit, many will be damaged. Avoiding the use of this type of cleaner will decrease the risk of damage. To clean printed-circuit boards, simply apply an acceptable solvent with a stiff brush.

OHMMETERS

Some transistors with emitter-base reverse breakdown voltage, usually from one to five volts, can easily be damaged by an ohmmeter that contains an internal battery with a potential up to 22½ volts dc. Voltage "spikes" can cause a buildup of impurities in the collector and emitter junctions. As a result of this accumulation, an internal short from

Multi-wired cannon plugs require the right soldering iron and a steady hand.

Photos courtesy of 63d Avionics Maint. Sq.



collector to emitter can develop. Also, in the case of ohmmeters, excessive current (on the low-resistance ranges particularly) can burn out transistor junctions. Vacuum-tube voltmeters sometimes have on the leads a-c voltage potentials that are high enough to damage the more sensitive transistors.

POWER-SUPPLY POLARITY

Because semiconductors are polarity- and voltage-sensitive devices, power-supply polarities must be considered when the resistances of the circuits of modular assemblies containing transistors or other semiconductors are measured. Reversing the plate-voltage polarity of a conventional triode vacuum tube will keep the stage from operating but generally will not injure the tube; in the case of a transistor or other semiconductor, however, reversal of the collector-voltage polarity will ruin it, instantly and permanently. It is also good maintenance practice to have the power supply disconnected whenever a transistor or any one of its leads must be removed. In short,

- DO know and apply your test equipment properly, and
- DO use extreme care when mating connector leads. Insure that they have the proper polarity.

SPECIAL HANDLING

Great care should be taken during receipt and shipment of the insulated-gate type of transistor. To protect this type of component in shipment, some manufacturers either solder all the leads together or wrap them in fine wire on conductive foil. Maintenance personnel should experience no trouble in handling these transistors if the following safety precautions are taken:

- DON'T unpack the device until it is ready for use. If the leads are soldered or wrapped, they should not be separated until the device is to be installed.
- DO wrap a fine wire around all the leads at the point where they enter the casing, and then proceed to separate them.
- DO attach a ground to the tip of the soldering iron prior to use.
- DON'T use a soldering gun.
- DO provide a heat sink for each lead between transistor and iron before soldering.
- DO remove the shorting wire from the leads after all of them have been connected.

CONCLUSION

This article highlights the most common causes of damage to semiconductors through improper servicing and testing and emphasizes some of the safety practices to be applied to prevent obvious types of abuse. Once a maintenance technician knows the physical and chemical limitations of semiconductors, his own common sense should dictate proper handling and servicing. Accordingly,

- DO use your head and apply the proper tools to do a good maintenance job that will insure equipment readiness.

(Reprinted from U. S. Naval Aviation Weapons Systems DIGEST) ★

Melting Temperatures of Transistors and Associated Materials

MATERIAL	TEMPERATURE	
	°F	°C
60/40 LEAD/TIN SOLDER	372	189
SILVER SOLDER	1377	747
ALUMINUM	1220	660
SOLDERING IRON TIPS (minimum)	500	260
SILICON TRANSISTOR JUNCTION (maximum)	392	200
GERMANIUM TRANSISTOR JUNCTION (maximum)	212	151
MIL-E-5400-J — CLASS 1 AVIONICS EQUIPMENT	131	55
MIL-E-5400-J — CLASS 4 AVIONICS EQUIPMENT	257	125
MIL-E-5400-J — ALL CLASSES	65	54

☆ U.S GOVERNMENT PRINTING OFFICE 1970 391-400



FROM INSTRUMENT TO CONTACT"

. . . Allow me to add a specific problem
ea to Maj Carmack's excellent article
rom Instrument to Contact" in the April
rospace Safety magazine. If an approach
der low visibility conditions is accom-
nied by a strong crosswind component,
e pilot's first view of the runway environ-
nt will be at an acute angle to the fore-
d-aft axis of the aircraft. The instinctive
ction is to turn the aircraft so as to
gn it with the runway. Obviously, this
l cause the aircraft to drift to the down-
nd edge of the extended runway or, per-
haps, completely out of the runway confines. The pilot now has nine or ten seconds to get back within the runway limits, establish the crab/wing-down landing attitude, and hopefully land safely. The situation is usually accompanied by a slippery runway, so the possibilities for trouble are limitless. The solution, of course, is to plan ahead. If you have been holding a large correction down the glideslope, it is pretty obvious the runway is not going to appear directly ahead of the nose of the aircraft....

Maj Robert Downs, MAPMAC
Scott AFB IL

"MINIMUM" VS "EMERGENCY"

In your March 1970 issue, the article on minimum fuel failed to stress one point that might save an aircraft and a lot of explaining some day.

My point is the difference between declaring "minimum fuel" and "emergency fuel" and what they mean to all air traffic controllers (see FLIP Planning for the latest definition). It is my contention that there are still a lot of old pilots flying around who expect priority treatment when they declare "minimum fuel."

Maj Robert L. Russell
Seymour Johnson AFB, NC

We said "minimum" instead of "emergency" fuel because that should be the point where your problem is identified—and action begins. Even though you don't get priority per se when you call minimum fuel, you have alerted the controller and started his planning.

About the old pilots flying around who haven't kept up with the times—let's hope not!

UR EXHIBITS

The article which you printed in *Aerospace Maintenance Safety* dated June 1969 on identifying UR exhibits with AFTO Form 114 has proven to be very effective. There have been no reports of receiving UR exhibits improperly identified since your June 1969 publication. Thank you for your fine cooperation. However, there is another problem.

UR exhibits for U-3 aircraft components are being received here which have no exhibit value. Approximately 90 per cent of the (proposed) exhibits have been partially disassembled and/or had components replaced. These conditions destroy the effectiveness of a comprehensive technical investigation. Comply with procedures as outlined in Section V of TO 00-35D-54 for effectively processing UR exhibits.

Real exhibits get Real results.

D. O. BOWLAN
Chief, Quality Assurance
Cessna Branch
Wichita, Kans



Safety Awards 1969



FLIGHT

AAA	17th Tactical Airlift Squadron, Elmendorf AFB
ADC	48th Fighter Interceptor Squadron, Langley AFB
	78th Fighter Wing, Hamilton AFB
AFLC	Air Procurement Region Far East, Tachikawa AB
AFRES	934th Tactical Airlift Group, Minn-St Paul Intl Aprt
AFSC	Air Force Eastern Test Range, Patrick AFB
ANG	140th Tactical Fighter Group, Buckley ANGB
ATC	3560th Pilot Training Squadron, Webb AFB
	3645th Pilot Training Squadron, Laughlin AFB
	3515th Pilot Training Squadron, Randolph AFB
AU	3800th Air Base Wing, Maxwell AFB
MAC	89th Military Airlift Wing, Andrews AFB
	40th Aerospace Rescue & Recovery Wing, Ramstein AB
	61st Military Airlift Wing, Hickam AFB
PACAF	463rd Tactical Airlift Wing, Clark AB
	315th Tactical Airlift Wing, RVN
	356th Tactical Fighter Squadron, Takhli RTAFB
SAC	28th Bombardment Wing, Ellsworth AFB
	319th Bombardment Wing, Grand Forks AFB
	92d Strategic Aerospace Wing, Fairchild AFB
TAC	311th Tactical Fighter Training Squadron, Luke AFB
	426th Tactical Fighter Training Squadron, Luke AFB
	464th Tactical Airlift Wing, Pope AFB
USAFE	10th Tactical Reconnaissance Wing, RAF Alconbury
	7101st Air Base Wing, Weisbaden AB

MISSILE

CATEGORY I (Air-Launched Missiles)

AAC	21st Avionics Maintenance Squadron, Elmendorf AFB
ADC	Air Defense Weapons Center, Tyndall AFB
	78th Fighter Wing, Hamilton AFB
ANG	115th Fighter Group, Truax Field, Madison
PACAF	355th Tactical Fighter Wing, Takhli RTAFB
	12th Tactical Fighter Wing, Cam Ranh Bay
SAC	42d Bomb Wing, Loring AFB
	100th Airborne Missile Maint Sq, Davis-Monthan AFB
TAC	57th Fighter Weapons Wing, Nellis AFB
	33d Tactical Fighter Wing, Eglin AFB

CATEGORY II (Ground-Launched Missiles)

ADC	46th Air Defense Missile Sq, McGuire AFB
SAC	321st Strategic Missile Wg, Grand Forks AFB
	381st Strategic Missile Wg, McConnell AFB

CATEGORY III (Units Launching Missiles—Test and Research)

ADC	Aerospace Defense Group, Vandenberg AFB
AFSC	6555 Aerospace Test Wg, Patrick AFB

CATEGORY IV (Ranges, AFSC Divisions and AMAs)

AFSC	Air Force Eastern Test Range, Patrick AFB

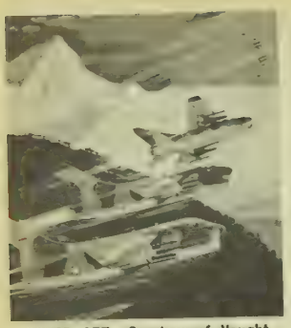
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Aerospace SAFETY

UNITED STATES AIR FORCE • AUGUST 1970



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Deputy Inspector General for Inspection and Safety, USAF

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UNITED STATES AIR FORCE

Aerospace SAFETY

AUGUST 1970

FOR AIRCREWS, MAINTENANCE & SUPPORT TECHNICIANS

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DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

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AUGUST 1970 AFRP 127-2 VOLUME 26 NUMBER 8



Lt Col David A. Crossman, Directorate of Aerospace Safety

UEIs and YOU

Early one morning, as you pass Base Ops on your way to work, you notice a transient C-118 parked and a couple of people deplaning. Another glance at the group stirs your curiosity about who's arriving, for amidst the reception party greeting a General Officer you note the Wing Commander, the DO, the DM and your boss, the Chief of Maintenance. Continuing on to your duty section you try to remember who was scheduled in today. Nothing was said at the staff meeting Friday morning. . . . Suddenly a sinking feeling comes over you: "Oh, no, they can't be the IG No-Notice team."

As you herd your car into the parking lot a multitude of items are running through your mind—things that should have been seen to before they hit us. What was it the boss said last month? "Get out our latest inspection and safety survey reports and insure we have complied with the stated corrective actions. Also, run that self-survey checklist through each of your activities. We have got to get ready for this no-notice program the IG has come up with."

The scene is set for what could happen to you some morning. For some of you the experience is history. The Unit Effectiveness Inspection (UEI) program conducted by the USAF Inspector General (TIG) has been in operation since late July 1969. The program was implemented by Chief of Staff direction and is designed to apprise him and subordinate commanders of the operational capability of Air Force units world-wide. During FY 70 UEI teams have traveled on 52 efforts, visited 81 locations, and inspected 91 units, within 13 major air commands.

The implication in the *staged* setting is that the individual's area of responsibility is not ready for inspection or at least he has a feeling of uncertainty. The age old procedure of preparing your shop for a pre-announced inspection has been preempted by the UEI program. No longer do you have the advantage of

UEIs



A member of the UEI team will be

"clean up and look sharp while the IG is here." What frequently happened to units under the pre-announced inspection program was that management actions taken to eliminate or correct deficiencies were short term measures which unexplainably vanished after the inspection team departed. This situation is ineffective and does not truly reflect the daily routine posture of the unit being inspected. The no-notice concept places the emphasis on the quality of management as it really is.

Analysis of UEI reports indicates that a number of findings in the maintenance area are common to the majority of units visited and very possibly exist in your unit. Those of you already visited will probably call *foul* but it's time to air these common maintenance deficiences in the interest of better aircraft maintenance which will result in safer aircraft and an increased operational capability. The topics which follow are not all-inclusive of common maintenance deficiencies noted during FY 70 UEIs; but they do represent deficiencies that significantly degraded the quality of maintenance and jeopardized the USAF Aircraft Accident Prevention Program.

TECHNICAL DATA

One of the first items of business for some of the maintenance UEI team members is a walk-through of the maintenance work areas, flight line and most shops. Invariably their note pads start to fill up with names-dates-and places of maintenance being performed without technical data at hand. This violation of a basic maintenance principle is frequently found throughout the maintenance complex starting at the flight line and continuing through all shops. Typical specific acts noted include:

- Preflight/postflight inspections being accomplished without use of work cards.
- Periodic/phase inspections being accomplished without use of work cards.
- Engine runups in progress without use of checklists.
- Engines being built-up without reference to TOs.
- Avionics repair actions being accomplished on aircraft and in-shop without use of TOs.
- Aircraft servicing operations being conducted without use of checklists.
- Tightening of fittings that require specific torque values without the use of a torque wrench or reference to TOs.

If these findings read like a broken record sounds, you need only to read one accident report where failure to use tech data resulted in the loss of a valuable aircraft and human life. Then the WHY of the continual cry of *use that tech data* comes through loud and clear.

A point of interest to the inspectors is how quickly the word gets around the maintenance complex. By that afternoon or the next day, the TOs and checklists are being used.

QUALITY CONTROL/ASSURANCE

When the maintenance watchdog goes to sleep, or if his barking goes unheard, the bird killer—maintenance malpractice—will create utter chaos in your hen house. The type



ir area within minutes after arriving on base—be ready for him

and number of deficiencies noted in the QC/QA sections of the various units inspected suggests that management's primary tool for sampling the quality and reliability of the maintenance effort, *Quality Control,* is in many instances ineffective and in some cases apparently ignored by management. Review of QC/QA activities revealed these common deficiencies:

- Work cards and checklists overdue 90-day validation.
- A low failure rate of job evaluations noted in units under the Maintenance Standardization Evaluation Program (MSEP).
- In-progress inspection program ineffective and not monitored by QC.
- 180-day activity inspection not thorough and searching.
- Excessive time taken to route inspection reports through appropriate supervisors.
- Corrective action answers to inspection reports poor and permanent corrective action not being taken.
- Lack of follow-up by QC to insure stated corrective action was complied with.
- Unsatisfactory inspection reports not forwarded to top level management for review.

An effective Quality Control program is a two-way street maintained in balance by management's attitude, influence and emphasis. The inspections must be thorough, searching, and frequent enough to insure a representative sample of the routine maintenance effort. The criticisms reported by the inspection must be reviewed in proper perspective so that corrective actions taken are meaningful and lasting.

Actually, the maintenance findings of a UEI are a direct reflection on the effectiveness of the unit's QC program. Determination of where the weakness lies—management emphasis, QC itself, or apathy within maintenance sections is readily apparent by reviewing inspection reports and corrective action.

MAINTENANCE ANALYSIS

The use of deficiency analysis in the role of "trouble-shooter" for management is ineffective and in some instances non-existent. The lack of an active analysis program is denying managers, supervisors and technicians valuable and needed assistance. The raw data is available in abundant quantity—incidents, UMRs, inspection reports, high failure rates, etc., but very little meaningful analysis is performed. Examples of UEI findings which support this contention are as follows:

- High failure rate items identified but no attempt made to determine failure cause factors.
- Maintenance malpractices identified in Quality Control inspections but no attempt to determine personnel responsible in order to conduct retraining.
- Ineffective in-process inspection item listings due to a lack of comprehensive review and coordination with Quality Control and work centers.

To condemn an individual for a malpractice or an aircraft system for a malfunction is easy. More times than not all that transpires is criticism of the man or the equipment. What is really needed is to determine *why* the man did what he did or *why* the system failed. When you have the *whys* then you're well on your way to preventing the act from recurring. To determine the *whys*

UEIs and YOU



Inspecting the Hot Dip Direct Heating Tank

of your maintenance problems is the task of deficiency analysis—*why not try it?*

AEROSPACE GROUND EQUIPMENT (AGE)

You could easily classify most of the numerous AGE deficiencies as poor housekeeping, ground safety violations, or inadequate maintenance practice and never think of them as potential hazards to safe flight. Some AGE conditions, such as contaminated servicing units or hydraulic test stands, are obviously flight safety hazards. But dirty, delapidated maintenance stands, leaky jacks, or paint-peeled hand starting power units couldn't possibly be a hazard to safe flight, could they? You bet they can. The condition and use of AGE is a reflection of the maintenance attitude of a unit and is a good indication of how maintenance is conducted—by professionals or by shade tree mechanics. Neglected AGE leads to poorly cared for aircraft which creates a serious hazard to safe flight. UEI AGE findings include:

- Inadequate corrosion control program evidenced by the substandard condition of AGE in use and on the ready line.
- Inadequate daily preflight of powered AGE, evidenced by readily detectable but unrecorded discrepancies of AGE in use and on the ready line.
- Inadequate attention given to AGE delayed discrepancies.
- AGE maintenance repair actions accomplished without reference to technical data.

Neglected AGE soon becomes unserviceable AGE which then requires overextending the utilization of the remaining units until the situation has snowballed to the point that your aircraft maintenance capability is hampered. The next step is a crash project to get the units serviceable and then the cycle starts all over again. If you've been through the cycle, why not try caring for the equipment on a daily basis?

The type of deficiencies noted by UEI teams are not new or different. In fact, they read much the same as findings in inspection reports submitted by your local or higher headquarters inspection activities. However, many identified and reported deficiencies are not being corrected or the corrective action is not effective to insure permanency. A disturbing point is that many of the findings noted by a UEI read virtually the same as aircraft accident cause factors determined by investigation boards. What more impressive motivation is there than the need to correct a maintenance malpractice that caused the loss of an aircraft and human life. Not only correcting that specific malpractice, but surveying the entire maintenance operation to ensure that other conditions which caused the loss of aircraft or life are corrected. If the old adage of "do the job right the first time—everytime" is promoted by management, adopted by technicians, and enforced by supervision then you won't have that "sinking spell" when the UEI team arrives at your base. ★

THE I.P.I.S. APPROACH

By the USAF Instrument Pilot Instructor School, (ATC) Randolph AFB, Texas

CIRCLING APPROACH

A note in the IFR Supplement states, "The circling MDA and weather minima to be used are those for the runway to which the final approach is flown—not the landing runway." The reason you use the minimums for the runway to which the final approach is flown is to assure that required obstacle clearance is provided in both the final approach and circling approach areas. Despite this note, there is still confusion on this point, and some pilots are still using minimums for the runway to which they are circling.

HIGH ALTITUDE TEARDROP PENETRATIONS

We have had several questions and comments on our October 1969 "IPIS Approach" article concerning teardrop penetrations. Specifically, how do you "remain within, etc." specified on some VOR and ADF high altitude approaches. In order for you as a pilot to be required to remain within a certain distance on a teardrop VOR or ADF penetration you should be provided a fix (DME, crossing radials or radar); otherwise, there is *no precise* method of determining your range from a VOR or ADF. If a VOR or ADF teardrop penetration approach is constructed according to JAFM 55-9 the obstacle clearance limit criteria are based on the amount of altitude to be lost and course divergence in the teardrop penetration. *Do not confuse with procedure turn depictions!*

MISSED APPROACH CLIMB GRADIENT

Whenever a missed approach procedure requires a climb gradient greater than 150'/mile, a note is added on the approach plate and the required climb gradient in feet/mile is published. For example, Norton AFB (SW High Altitude Terminal) missed approaches require climb gradients greater than 150'/mile. How do you as a pilot, convert feet/mile climb to a vertical velocity rate? A simple technique used at the IPIS is to multiply your groundspeed in nautical miles per minute times the required climb gradient. For example, the Norton ILS 4 RWY 5 missed approach requires 325'/NM climb gradient. If your missed approach climb airspeed is 180KTS (3NM/MIN) the vertical velocity rate needed to achieve 325'/NM is 975'/MIN, (325 x 3). For you jocks using MACH indicators, remember that indicated MACH times 10 is approximately true airspeed in nautical miles/minute. (Example—.3 MACH × 10 = 3NM/MIN.) Some pilots may feel that it's "No Sweat" to maintain a rate of climb sufficient to ensure missed approach climb requirements; but apply this technique to a loss of power situation. Can you maintain the required climb gradient at engine-out climb airspeed?

POINT TO PONDER

AFM 51-37 allows you to start descent from procedure turn altitude, with outbound course guidance, when the aircraft is headed inbound and positioned within 20 degrees of the inbound course. The *revised* AFM 51-37 will allow descent from the procedure turn altitude, with outbound course guidance, when the aircraft is positioned within *10 degrees* of the procedure turn course and is on an *inbound intercept heading.* Rationale for this change is that, a pilot descending to the FAF altitude 20 degrees off the inbound course and 15NM out (Category E) may not have sufficient obstacle clearance.

The final draft of the revised AFM 51-37 has been forwarded for editing and printing, hopefully it will be on your desk soon.

IRC MAILING LIST

The IPIS requests those agencies conducting Annual Instrument Refresher courses to forward their current mailing addresses. These will be used to correct the IPIS mailing list and will insure that your IRC receives up-to-date materials for instrument training. Send addresses to USAF IPIS (AT), Randolph AFB TX 78148. ★

GUIDE TO DRUG ABUSE



Maj Paul T. Hansen, USAF, MC, Hq ATC

MODERN CHEMISTRY has produced an almost infinite variety of drugs for the benefit of man. Unfortunately, the qualities that make these drugs effective and desirable also promote abuse with undesirable—even dangerous—consequences. Abuse is not limited to the furtive pill popper, acid head or mainliner, but is exhibited by vast numbers of "straight people" who overdose, borrow or self-prescribe prescription or over-the-counter remedies. Drug abuse and flying are not compatible, as the author points out in the following article. Although written for aircrews—primarily pilots—the article applies to maintenance personnel, air traffi

controllers and any others whose work may affect the successful performance of the flying mission.

Our society has become drug oriented, and no longer can we hide behind the old stereotyped, artificial line drawn between narcotic drugs and non-narcotic drugs, bad drugs and good drugs, illegal drugs and legal drugs, dangerous drugs and safe drugs. *A drug is any chemical that produces an effect when taken into the body.* The resultant effect may be beneficial, harmful, or both, depending upon what is taken, who takes it, how much he takes, and why he takes it. Aspirin is a drug. Opium is a drug. Penicillin and coffee are drugs. Marihuana, LSD and nicotine are all drugs.

No longer can we concern ourselves only with the classical distinction between use, habituation, dependence and addiction. Any usable drug can and probably has been abused by someone. Abuse occurs when a drug is inappropriately, unwisely, intemperately or illegally used. Most of us are aware that alcohol can be both used and abused. In a similar way aspirin and penicillin can be both used and abused. For some drugs such as opium or heroin, the mere use obviously constitutes abuse.

THE REAL FINK

Common sense dictates that flyers should not abuse drugs, yet the same personality traits that lead to drug abuse also lead to irresponsible behavior. Thus, flight safety and mission effectiveness behoove all student pilots, pilots and instructor pilots to observe their fellow aviators for any indication of possible drug abuse. Of course, drug abusers consider this "finking," but the real fink is someone who would knowingly allow a drug abuser to risk lives and airplanes by flying.

Most of us would recognize a drug abuser who sat with his flying suit sleeve rolled up and "mainlined" some drug during a premission briefing. Unfortunately, the secretiveness of most drug abusers and the subtleness of some drug effects make detection by both the trained and casual observer very difficult. In addition, the frightening possibility exists that someone who is now straight, yet used acid or STP in the past, may appear completely normal. He may even think all is normal. The danger lies in the possibility of a "flashback" occurring. A flashback is a "free trip." Someone who has taken LSD or STP in the past can at any time, suddenly, spontaneously, and unpredictably start on another trip. Obviously such a happening could result in his death, your death or someone else's.

The user of the so-called hard drugs, e.g., heroin, opium and mainlined speed, is not hard to recognize. The self-destructive personalities necessary to use these drugs are not usually conducive to achieving the level of performance necessary to be a USAF pilot. Thus, the easier a drug abuser is to spot the less likely he is to be a fellow flyer.

We all know that the alcoholic can vary from the skid row derelict to the completely normal appearing gentleman. Likewise, drug abusers vary in appearance from obviously antisocial appearing characters to neatly dressed, crew-cut aviators. Most signs of drug abuse in a pilot are subtle and nonspecific; very few are definitive. Look for two main clues to increase your level of suspicion:

Intoxication—Intoxication by most drugs is similar to the intellect and performance decrements manifested by alcohol intoxication. Some signs of intoxication—all drugs:

- Judgment impairment
- Overconfidence
- Decrease in coordination
- Difficulty with speech, e.g., slurring
- Pinpoint pupils in subdued light
- Dilated pupils in brightly lit areas
- Euphoria
- Depression
- Excessive sweating
- Tremor

Inappropriate changes (particularly if occurring over a one to two week period of time)—best seen by close friends and associates:

- Changes in behavior
- Marked changes in personality
- Sudden changing of friends and associates
- Inappropriate secretiveness of actions
- Inappropriate mood
- Irresponsible behavior
- Sudden changes in manual dexterity
- Sudden changes in academic performance

The more one looks for the subtle signs the more likely he is to detect them.

It should be stated that each of us may manifest one or more of these signs and symptoms at one time or another and not be a drug user or abuser. In fact, the fledgling pilot frequently displays combinations of enthusiasm and anxiety that might resemble drug effects, e.g., bumping into doors, stumbling over chocks, slurring of speech, excessive sweating, inattentiveness, etc. In most of these instances all the student needs is direction, sympathy and understanding; but we must watch out that the drug abuser doesn't hide behind the mask of a bumbling student.

"Keep alert, watch for THE *OTHER* TRAFFIC." ★



PLANE TALK

Lt Col Scotty O. Ferguson, Directorate of Aerospace Safety

From the sound of things in the air these days, aircrews are having difficulty with one of the basics of aviation: *voice communications*. Here is where air discipline has been sorely neglected.

The written guidance on air to ground communications is not consolidated in one document for quick and easy reference, and perhaps this should be done. However, the do's and don'ts of airborne radio transmissions are available in publications such as FLIP Planning, FLIP Enroute and Airman's Information Manual. This guidance used with a modicum of common sense and professional pride would make our radio frequencies a lot less cluttered. This in turn would eliminate a great deal of the confusion in high density air traffic areas.

AFM 51-37 (Instrument Flying), Chapter 15, under voice procedures says, "During an approach, repeat all headings, altitudes and altimeter settings; acknowledge all other instructions unless otherwise advised. During high density radar operations, a limiting factor is the communications time available. Keep transmissions brief and specific, commensurate with safety of flight."

The accepted method of acknowledging transmissions is with either ROGER or WILCO preceded by the aircraft or tactical call sign. No other words are necessary or called for.

The enroute portion of flight is probably where radio discipline gets the most abuse. FLIP Planning tells us to advise center when we are *vacating* a previously assigned altitude, but it does not require us to announce our *arrival* at an altitude. When we are given a new frequency all that is required or desired is an acknowledgement, not a repeat of the new frequency. When we check in with an enroute center controller, we are required only to state the assigned cruising altitude; and, if climbing or descending, the altitude passing.

Unless otherwise requested, enroute clearances require only an acknowledgement, not a repeat of that clearance. And, incidentally, when being passed from one controller to another, "Thank you, sir, and good day," may make the controller feel warm all over, but it irritates fellow aviators on the same frequency. When flying in a non-radar environment, more words are necessary but following prescribed procedures will minimize transmission time.

The skies are getting more crowded every day and consequently, strict air discipline becomes increasingly important. There are definite procedures to follow in the operation of all aircraft systems. The radio is one of those systems. Know and use the correct procedures. ★



Toots

is interested in your problems. She spends her time researching questions about Tech Orders and directives. Write her c/o Editor (IGDSEA), Dep IG for Insp & Safety, Norton AFB CA 92409

Dear Toots

Please help settle a difference of opinion concerning the aircrew check of the longitudinal flight control check on the RF-4C before taxiing. The difference centers around TO 1F-4(R)C-1, page 2-25, para 5; TO 1F-4C-2-4, para 3-29 (for example), plus an article "F-4 Flight Control System—Faults and Fixes" authored by Maj Jerry Gentry, USAF Flight Test Center, Edwards AFB, which has appeared in the Feb 1970 *TAC Attack* and May 1970 *AIRSCOOP*. It is my opinion that the references are correct, as listed above. It is the opinion of my operations officer and a tech rep from McDonnell-Douglas that all those references are not enough to require the stick to remain aft on the flight control check.

My question: After TO 1F-4-831, with two units nose down trim, what is the stick supposed to do when I pull it to the aft stop, hold it momentarily and then release it? And what are the limitations, if any?

If the stick is allowed to (or may) fall forward to the stop at any rate which happens to be there, what are the chances of getting the applicable tech orders changed. And, if the stick is *not* allowed to fall to the forward stop, please tell me why and how I should enter this in the 781 as a discrepancy when the stick *does* fall forward.

Maj Bernard F. Albers
APO San Francisco 96237

Dear Major A

The answers to your questions were provided by John Krings, experimental test pilot at McDonnell Aircraft Company. Perhaps others have the same questions so I am using his reply in full.

"I think the most important part of any check done to an airplane is to know what you are checking and generally what to expect. The actual technique and tolerances are often arbitrarily defined to standardize procedures or allow for normal variation in operators or systems.

The check under discussion is merely to check the freedom of movement of the longitudinal control system. Phrases like "free and easy," "a wet noodle," and "locked in concrete" mean various things to different people. So—we found in old 5 lb. bobweight F-4s that with TO trim the bobweight effect should overcome any allowable friction in the longitudinal control system. We now had a "built-in fish scale"—pull the pole back, lift the bobweights and let go to see if the bobweight can overcome the friction and pull the pole to the forward stop. The problem that developed later was the rigid interpretation of the check when it was a convenient guide to check the friction level.

When we incorporated the 3 lb. bobweight, obviously the system changed. If the allowable friction needed 5 lb. bobweights to overcome it, it stands to reason a 3 lb. weight may not be enough. It wasn't. Now with a 3 lb. bobweight the maximum allowable friction may exceed the effect of the bobweight. It is as simple as that.

We do not check for minimum friction. Friction in longitudinal systems is obviously undesirable. Therefore, any time the control stick goes forward, the farther and faster the better. If a 3 lb. bobweight will move the stick all the way to the forward stop, we have a good low friction system.

Remember the check is merely putting a known force (the bobweight) against an unknown force (the friction) and using the stick position/movement to measure the winner!

We flew thousands of airplanes in the past without making rigid inflexible, misunderstood, control checks with amazing results. A litle discretion is all that is required. Don't forget there is no "no brain" check for lateral and directional friction.

With a 3 lb. bobweight it may or may not go forward, just move it back and forward and insure the friction is not too high."

Toots



Wake Turbulence

Reprinted from *Boeing Airliner*

VORTEX WAKE TURBULENCE has been a subject of interest for many years with the theory dating back to the beginning of powered flight. Hazards to following airplanes resulting from wake turbulence were recognized and published for light airplane operators as early as 1952. Development of large jet transports led to speculation that turbulent wakes generated by these airplanes would present a significant hazard to other air traffic and that special separation standards might be required for large jet transports. The Boeing Company began the study of wake turbulence in 1963. The study was continued to examine the effect of wake turbulence on following airplanes in mid-1969. This study was recently completed with a series of flight test evaluations conducted by Boeing in cooperation with NASA and the FAA.

Wake turbulence should not be confused with "jet wake" (sometimes called "jet blast" or "thrust turbulence"). Jet wake is created by high-velocity air expelled from the fan and turbine of a turbojet engine. Jet wake is of concern only when the airplane is taxiing or parked with engines running. Jet wake has no significant effect on wake turbulence.

Wake turbulence or vortex turbulence, on the other hand, is generated during flight when the wing is developing lift. Figure 1 shows the vortices are two counter-rotating air masses, the right wing vortex rotating counterclockwise, and the left wing vortex rotating clockwise. The region of rotating air behind the airplane comprised of the trailing vortices is the turbulent wake.

WAKE TURBULENCE TESTING

Analytical studies of wake turbulence and its effect on following airplanes began at Boeing in July 1969 and culminated in a series of flight tests conducted in December 1969 and February of this year. In December, an evaluation of the 747's turbulent wake was conducted by flying behind the airplane with the Boeing-owned F-86. These tests indicated that the 747 wake did not present a hazard to following airplanes at the standard three mile separation. However, the F-86 pilot was unable to see the wake and therefore could not be assured that he had thoroughly sampled it. In subsequent tests, Boeing installed smoke generating equipment on the outboard engines of a 747 and a 707-320B. Smoke generated by this system in flight becomes "wrapped up" in the trailing vortices making them visible to chase airplane pilots. In February, Boeing conducted a series of tests in cooperation with NASA and FAA. These tests were

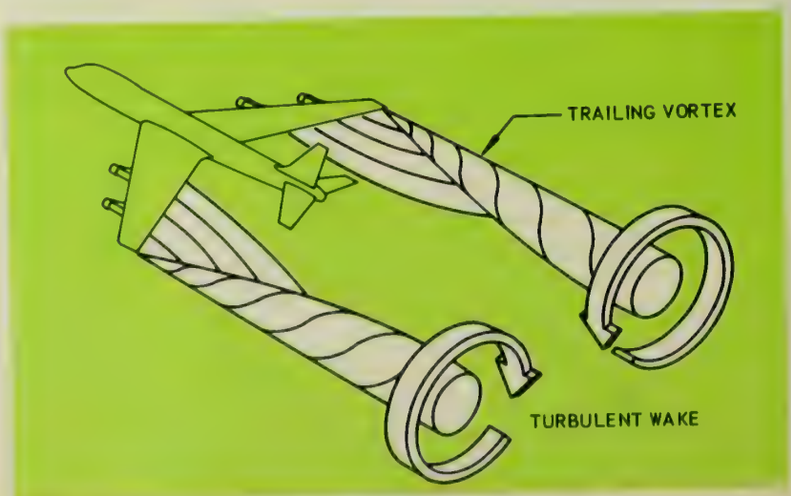


FIG. 1— Two counter rotating air masses form trailing vortices behind the airplane.

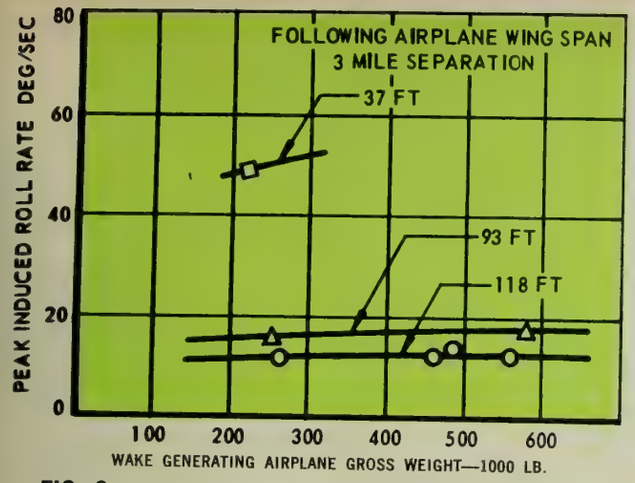


FIG. 2—Test data showing the roll experienced by airplane of a given wing span flying in wake of different weight airplanes.

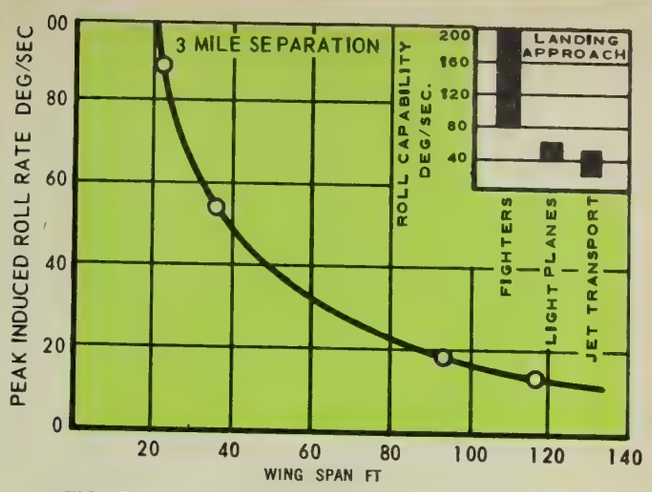


FIG. 3—Test data showing the roll experienced by airplanes of different wing span flying in wake of a 400,000 lb. airplane.

designed to provide a direct comparison between the 747 and an airplane representative of the current jet fleet, the 707-320B. The following tests were conducted:

- Boeing flew a 737-100 airplane in the wakes of a 747 and a 707-320B airplane at separations of 3 to 9 nautical miles. The 747 and 707 airplanes were airborne simultaneously and were flown in comparable cruise and approach configurations.
- NASA flew its Convair 990 airplane in the wakes of 747 and 707 airplanes. Again, the 747 and 707 were airborne simultaneously and were flown in comparable configurations.
- Boeing flew several passes with a 747 and a 707-320B in an FAA-conducted test over an instrumented tower at altitudes of 300 feet. The tower was instrumented to record vortex velocities and photograph vortex smoke trails.
- Boeing flew a 737-100 series airplane in landings behind a 747. The 737 followed the 747 by 1.8 to 3.0 nautical miles and was intentionally flown below the 747's glide slope to encounter and evaluate the effect of wake turbulence on landing.

Also during this same period, the FAA and NASA conducted tests with the CV-990 flying behind a C-5A, and tower fly-bys with a C-5A and other jet transport airplanes.

TEST RESULTS

The most significant result obtained from the tests was that the following aircraft (737 and NASA CV-990) could not detect any difference in the wakes generated by 747, C-5A, and 707-320B airplanes. Data from these tests and earlier NASA tests are shown in Figures 2 and 3. Figure 2 shows that the roll rate experienced by a following aircraft is approximately the same in the wake of a 200,000 lb airplane as it is behind a 600,000 lb airplane. Figure 3 shows that the wing span of the following airplane has an important effect on the roll experienced in the wake of a jet transport.

Another significant result obtained from the test was that the wake levels off below the generating aircraft. It was found that the wake moves down behind the generating aircraft at approximately 500 feet per minute as expected, but then levels off at approximately 700 feet below the airplane as shown in Figure 4. The wake was never found to be more than 900 feet below the flight path.

In the landing tests, a 737 made safe landings as close as 1.8 nautical miles behind the 747. It was found, however, that a combination of factors could lead to an undesirable wake turbulence encounter at such close spacings. These factors were a light (1 to 5 knot) crosswind com-

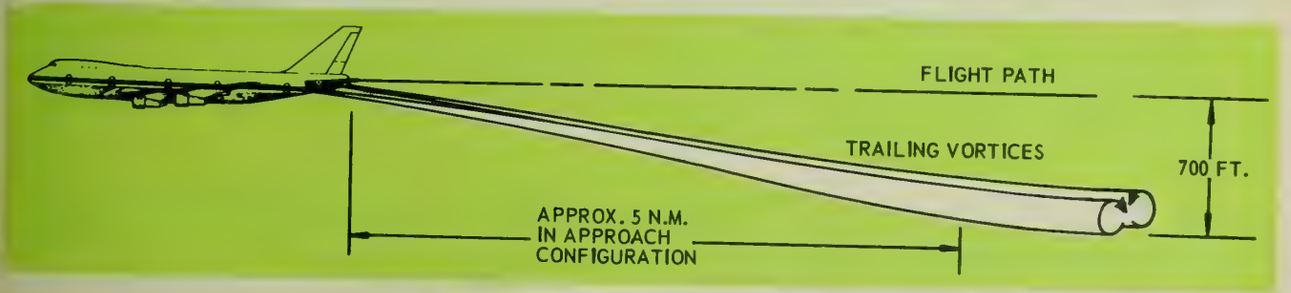


FIG. 4—(Above) Trailing vortices level off below the flight path and are never encountered more than 900 feet below the aircraft.

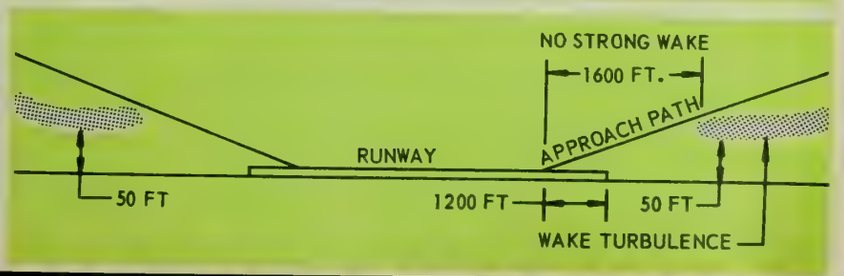


FIG. 5—(Right) The turbulent wake drops below glide path, away from touchdown area.

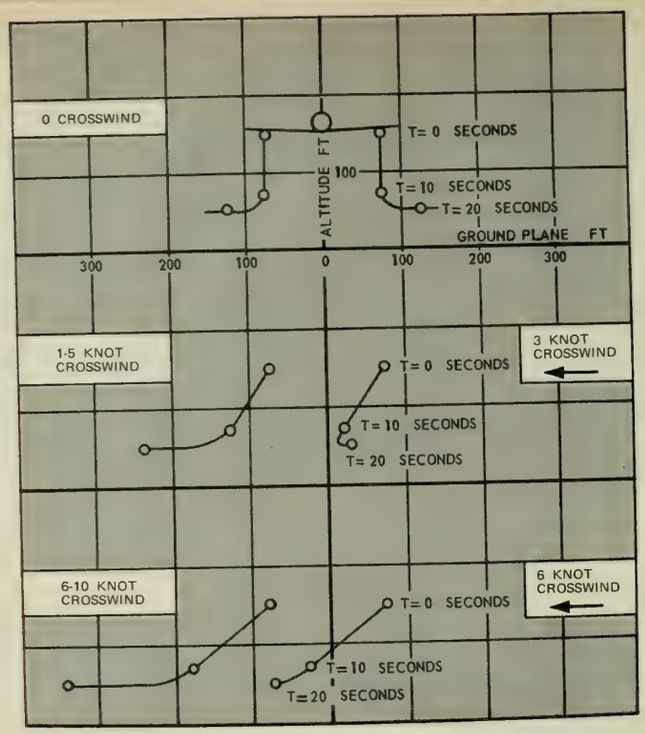


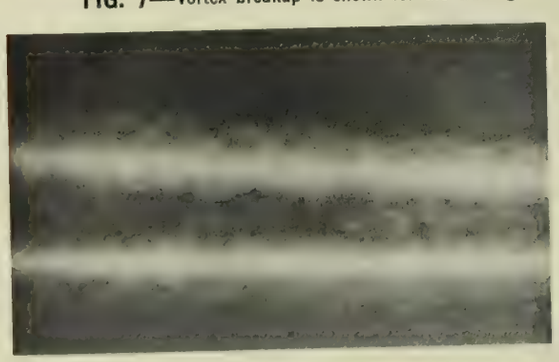
FIG. 6—Typical effect of crosswind on the movement of vortices near the ground.

bined with flying the following aircraft below the approach path of the preceding aircraft. No significant turbulence was encountered when landing the 737 approximately 2.5 nautical miles behind the 747.

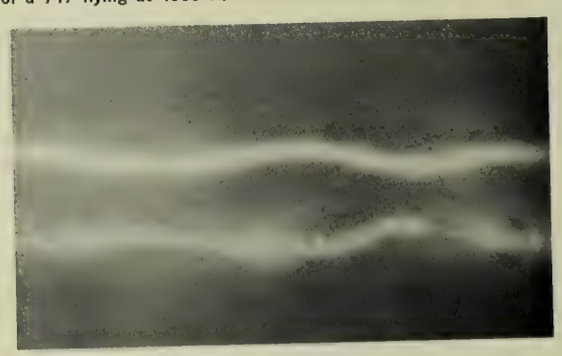
The tests also revealed that within approximately ½ wing span (50-100 feet for the 747) of the ground, the strength and movement of the vortices are strongly affected by the presence of the ground (ground effect). It was observed that when the generating aircraft is in ground effect, the wake does not form into concentrated vortices and turbulence in the wake is relatively weak. Thus as shown in Figure 5, there is no strong turbulence in the touchdown area. On approach and takeoff, the wake descends below the flight path until it enters ground effect whereupon the two vortices stop their downward descent and move laterally. This behavior is illustrated in Figure 6. With no crosswind, two vortices in ground effect move apart to clear the flight path. Crosswinds of 1 to 5 knots cause one vortex to remain near the flight path while winds greater than 5 knots cause the vortices to move quickly across the flight path and to break up rapidly.

Vortex breakup at altitude was also observed during these tests. In vortex breakup, the two vortices interact with each other to cause their mutual destruction. Figure 7 is a series of photographs, taken from the ground, showing breakup of the trailing vortices from a 747. The 747 was flown in takeoff configuration at 4900 feet altitude and from right to left. The photograph shown in Figure 7A was taken 10 seconds after the 747 passed overhead and shows two clearly defined vortices. Vortex breakup proceeds as shown at 90 seconds (Figure 7B) and 100 seconds (Figure 7C) until

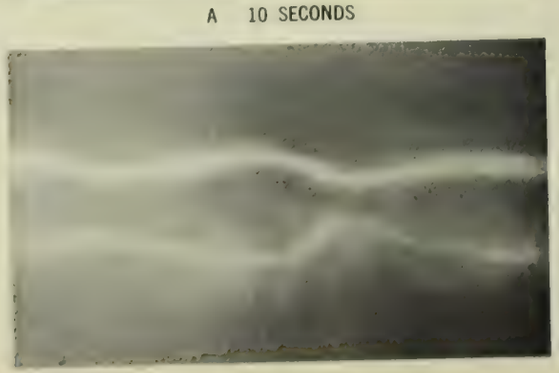
FIG. 7—Vortex breakup is shown for the trailing vortices of a 747 flying at 4900 ft. in the takeoff configuration.



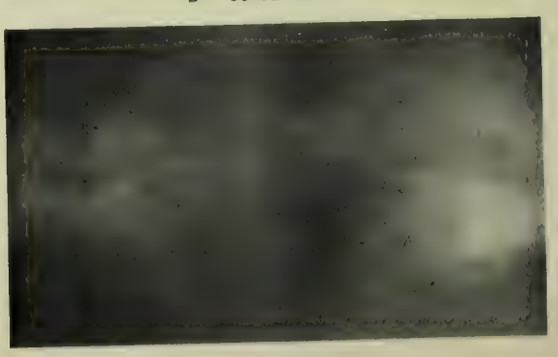
A 10 SECONDS



B 90 SECONDS



C 100 SECONDS



D 130 SECONDS

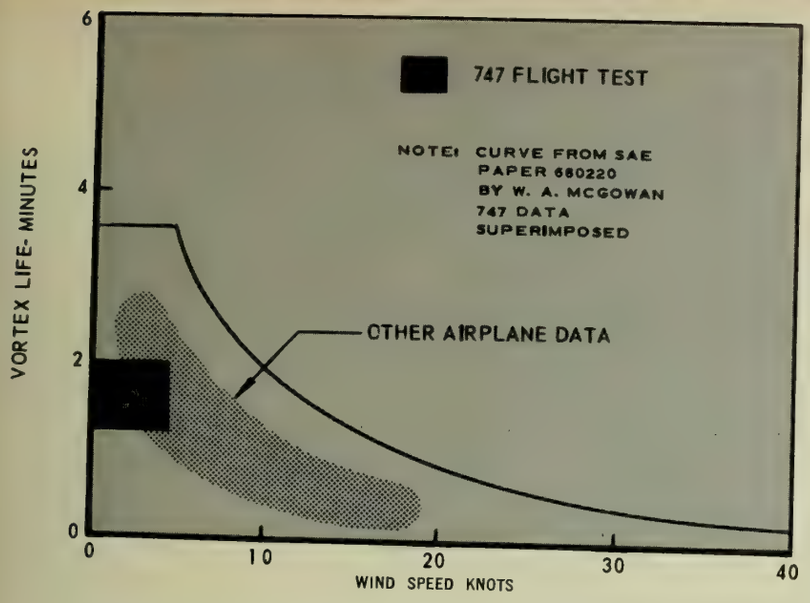


FIG. 8—Effect of wind on vortex life for vortices within 500 ft. of the ground.

at 130 seconds (Figure 7D), the two vortices are completely destroyed. This breakup is commonly seen in viewing contrails from the ground. Other investigators have found that breakup occurs more quickly when an aircraft has flaps down and when the atmosphere is turbulent. Within approximately 5000 feet from the ground, vortex life is directly affected by wind speed. The higher the wind speed the shorter is the vortex life (Figure 8).

WAKE TURBULENCE ENCOUNTERS

During the wake turbulence tests, Boeing and NASA pilots intentionally flew into the trailing vortices and attempted to hold the 737/CV-990 in the turbulence as long as possible. At no time did either aircraft experience control or structural difficulties. The severity of wake turbulence encountered during the tests could be described as being similar to penetrations of moderate clear air turbulence.

The response of an aircraft to typical vortex encounters is illustrated in Figure 9. A jet transport airplane entering wake turbulence will be quickly rolled out of the wake with maximum bank angles on the order of 30°. Yaw may also be experienced, particularly when the wake is approached from below, so that the vertical stabilizer is first to enter the turbulence. In any encounter, the aircraft is quickly expelled from the turbulence without experiencing unusual attitudes. An airplane will not be 'captured' by the vortex.

A new appreciation has been gained for the turbulence generated behind all transport aircraft. Test data and operational experience indicate that small airplanes (less than approximately 75-ft wing span or 75,000-lb maximum takeoff weight) may require increased separation from jet transport airplanes. Further study should be devoted to the separation requirements for these aircraft. Separation standards should be designed to minimize the possibility of a wake turbulence encounter and ensure that if an encounter occurs, it will not cause a severe upset or structural damage. Pilots of all jet transports should be encouraged to alert ATC if they observe a light airplane whose flight may cross their wake, or if they observe situations which they consider hazardous to light airplanes.

The test results presented here point to one simple but important procedure which all pilots can apply to avoid wake turbulence.

Fly on or above the flight path of the preceding aircraft.

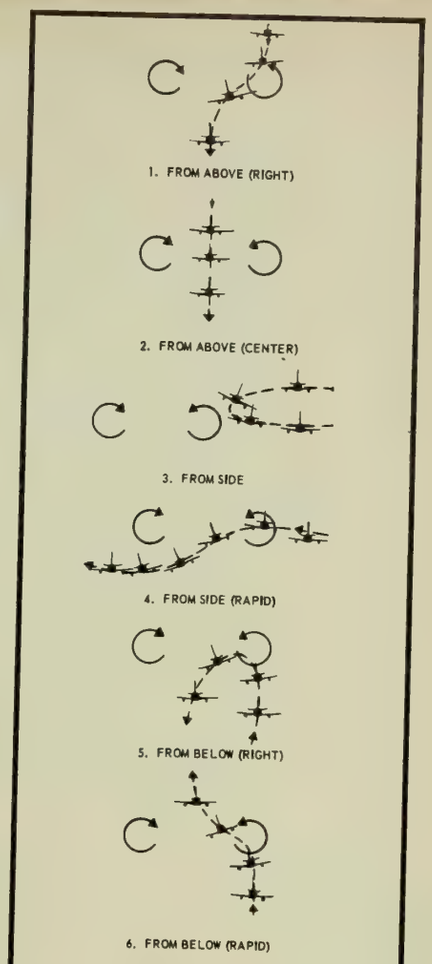
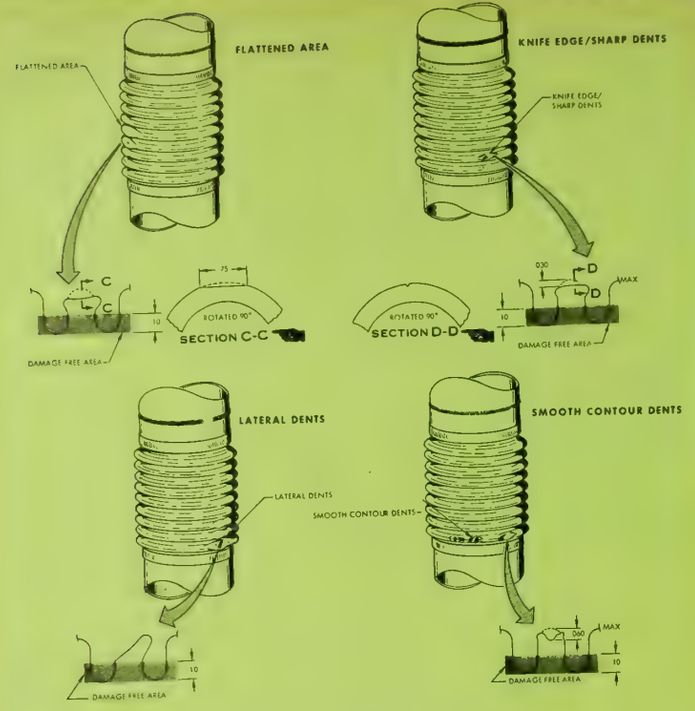


FIG. 9—Response of an airplane to typical wake turbulence encounters.

CONCLUSIONS

The tests conducted by Boeing have shown that wake turbulence generated by a 747 has the same effect as that generated by other jet transports operating prior to the introduction of the 747. Thus, the data indicates that the 747 is compatible with transport operations and does not require special separation standards.

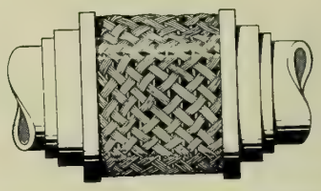
ED. NOTE: USAF has elected to retain conservative separation criteria until test data currently being acquired can be fully evaluated. Air Force controllers are directed to afford non-heavy jet aircraft (gross weight of less than 300,000 pounds) a ten mile in-flight or four minute arrival and departure separation behind C-5A and Boeing 747 aircraft. ★

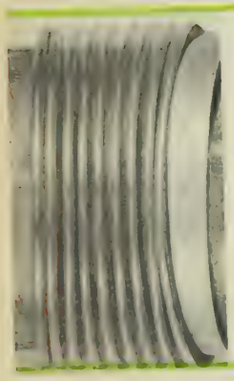


Note: The damage limits shown are intended to be typical. There is no intention to display specific damage criteria here. You must consult the applicable model technical instructions for exact information.

A NEW

Harold Poehlmann,
Fairchild Hiller Corp.
Directorate of Aerospace Safety





Bellows being subjected to a bend beyond its allowable design limits.



Example of a -4 steel braided flex line not having proper clearance from the bellows.



Material for the salvage yard



The appearance of the collapsed lower bellows and stretched upper unit could be a clue that the assembly is not installed correctly.

FLEXIBLE BELLOWS, long used in missile and spacecraft, have been put to widespread use in aircraft. They are frequently seen in jet engine compressor bleed air and fuel supply systems.

Aircraft system designers have found these flexible units particularly suitable because of their ability to absorb thermal expansion and contraction, their installation flexibility and ease of alignment during routine maintenance, and ability to handle both high and low temperatures.

Fine, you say, this looks like real good equipment. Right, but to keep it good we must protect it from damage. This abuse can take the form of dents, cuts, nicks, chafing, improper installation causing out-of-limits stretch or bend and any

BREED OF CAT



other wounds that "normal" maintenance can inflict. A dent caused by dropping a heavy tool on the corrugations is certain to produce a condition that can lead to rapid fatigue failure. Plumbing, cables or, in particular, a steel braid covered flex line that remains in contact with the bellows will literally "eat" through the thin bellows material in a time period commensurate with the vibration that is present and the contact pressure.

You probably have noticed that some flex ducts are covered with stainless steel braid, some have a heavy rubber cover shield, some possess internal reinforcement or stretch limiting struts. Regardless of construction, all react the same to external damage You would be amazed as to what happens when a low pressure fuel duct bellows develops a crack. The fuel escapes in a spectacular atomized spray, usually resulting in a 4th of July fireworks display. The cracking of a hot air duct produces equally serious inflight problems.

Someone from the back of the room has asked, "What can we do to prevent this?" Good question, we were just coming to this. The intent of this humble essay is to bring primarily two things to the attention of crew chiefs and mechanics: (1) that the service life of bellows ducting units can be shortened if they are allowed to remain in service with damage, and (2) the necessity of knowing where to locate the allowable damage criteria.

Tragic accidents are certain to develop from duct failure, whether they are conducting fuel, hot air or cryogenics. Reality indicates that maintenance mistakes will be with us till the end of time, but you must be capable of identifying a bellows that shows evidence of damage and detecting a bellows that is grossly out of alignment. You must also be diligent in locating and adhering to the appropriate damage allowance instructions. These usually can be found in the Structural Repair & Limits Manual Dash 3 Series for your aircraft or the Dash 6 Series in the case of engines.

My experience has been that there is a general lack of awareness as to what kind and degree of damage is tolerable on flex bellows. The basic design philosophy that can form a section of metal into a highly flexible unit with extraordinary service life is also very unforgiving when the hardware is subjected to damage. When in doubt call your inspection section for their "eagle eye" assistance.

Displayed here are some photos of typical damage along with some sample damage limits. These happen to be in connection with bleed air ducts. Notice the four general classifications: flattened areas, knife edge dents, lateral dents and smooth contour dents. We also draw your attention to the fact that trough or inner convolution damage are "no-nos" and ". . . no dents, no damage, no nuttin'."

When working in an area of flex ducts, temporarily cover or protect them against wrench slippage or fulcrum action. Do not pry against or stand on any units that might be in a vulnerable position in the lower engine compartment, such as a main engine fuel supply line. Make certain the line assembly is supported and not allowed to stretch a bellows, as when one end is disconnected from the engine. When installing a flex duct unit that has a swivel attachment, insure that the assembly is in proper alignment with all bellows in their normal design contours before securing the swivel connection.

Be suspicious of any bellows joint connection that has flanges that require abnormal gaps, compression or misalignment. This is usually a signal of improper design or installation, or bend damage. Subjecting a bellows to this deformation and stress is "bad news." If a bellows line is in jeopardy of becoming caught or jammed against an engine or airframe during engine removal, either secure it or remove the assembly to prevent damage.

The main object is to be aware of the stringent damage limits, where the data can be located and the need to give these "cats" a thorough 360 degree inspection after any unscheduled maintenance actions in addition to the routine inspection periods. Don't you be the one that played a part in causing high cost "4th of July fireworks out of season." ★

SELF-LOCKING NUTS

Gus Musulas,
OOMA, Hill AFB, Utah

During reassembly of aircraft wheels, flight controls, engine controls and other systems, maintenance personnel sometimes fail to replace worn self-locking nuts. Incident and accident reports frequently contain statements such as "examination revealed bolt was missing," or "visual inspection revealed bolt had become loose."

Serviceable self-locking nuts provide tight connections which will not loosen under vibration. Self-locking nuts approved for use on aircraft meet critical specifications as to strength, corrosion resistance and temperatures. There are two general types: Prevailing torque all-metal nuts designed with a thread distortion to provide the locking action and prevailing torque metal nuts with a nonmetallic insert to provide the locking action.

All metal, self-locking nuts are constructed with the threads in the locking insert out of phase with the load carrying section, or with a sawcut top portion with a pinched-in thread. The locking action depends on the resiliency of the metal when the locking action and load carrying portions are engaged by bolt or screw threads.

Non-metallic insert, self-locking nuts are constructed with an unthreaded non-metallic locking insert on top of the load carrying section or with a plug inserted in one of the side faces of the nut. The non-metallic insert has a smaller inside diameter than the nut; therefore, when a screw or bolt is inserted, contact is forced between the insert and the screw or bolt threads, causing the locking action. This type of self-locking nut should not be reused if the locking insert has lost its locking friction or become brittle, and it should not be subjected to temperatures in excess of 121°C (250°F).

The locking feature of metal and non-metallic insert type locking nuts 3/8 inch and smaller may be checked by the "finger tight" method. If a nut can be run down with the fingers after the locking feature engages the bolt or stud, indicating locking friction does not exist, it should be replaced. The minimum torque values for use with a standard torque wrench on used self-locking nuts over 3/8 inch are given in the table.

In some cases a new metal self-locking nut may not be the answer. For example, a metal self-locking nut that has been turned on and off many times may have worn threads on the stud or bolt to the point where a new nut will not lock. In such cases the only solution is to replace the stud or bolt.

To learn more about self-locking nuts see TO 1-1A-8. For example, paragraph 5-29 says, "New self-locking nuts shall be used each time components are installed in critical areas throughout the entire aerospace vehicle including all flight, engine and fuel control linkage and attachments."

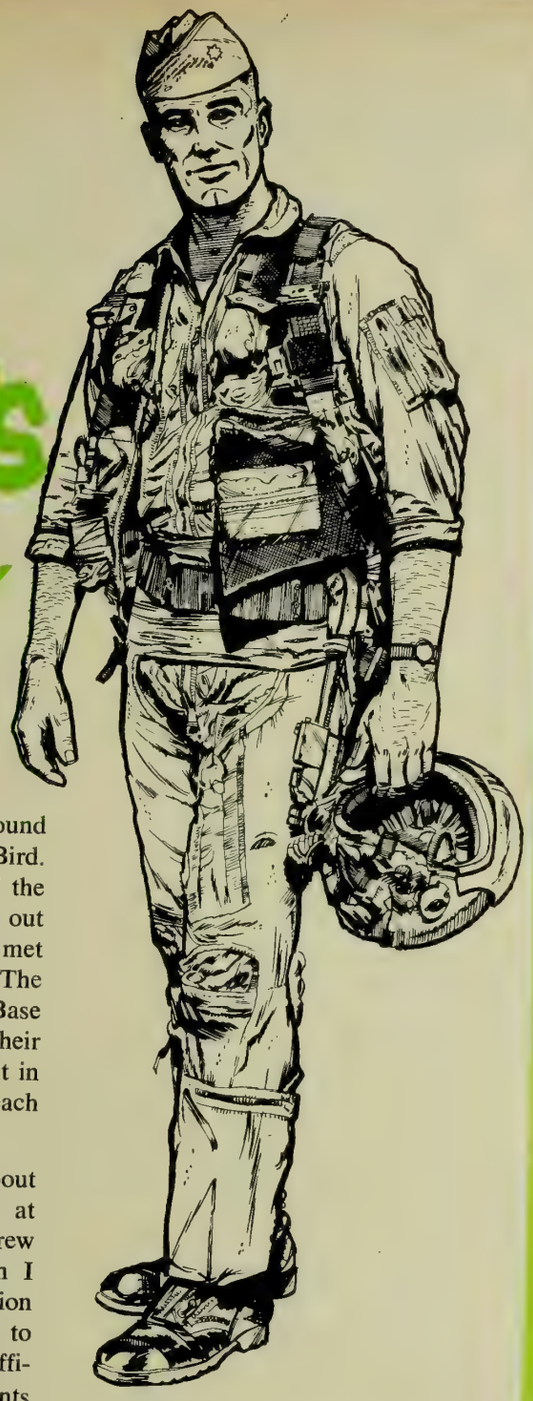
Section V has other info you can use. A review is suggested. ★

TABLE OF MINIMUM PREVAILING TORQUE VALUES

FINE THREAD SERIES		COURSE THREAD SERIES	
NUT SIZE	MINIMUM PREVAILING TORQUE	NUT SIZE	MINIMUM PREVAILING TORQUE
7/16-20	8 inch-pounds	7/16-14	8 inch-pounds
1/2-20	10 inch-pounds	1/2-13	10 inch-pounds
9/16-18	13 inch-pounds	9/16-12	14 inch-pounds
5/8-18	18 inch-pounds	5/8-11	20 inch-pounds
3/4-16	27 inch-pounds	3/4-10	27 inch-pounds
7/8-14	40 inch-pounds	7/8-9	40 inch-pounds
1-12	55 inch-pounds	1-8	51 inch-pounds
1-1/8-12	73 inch-pounds	1-1/8-7	68 inch-pounds
1-1/4-12	94 inch-pounds	1-1/4-7	88 inch-pounds

NOTE: Threads shall not be lubricated because the torque values of the chart were derived with oil-free threads. Minimum prevailing torque reading is established when the bolt or stud fully engages the locking feature.

REX RILEY'S CROSS COUNTRY NOTES



Last weekend I took a trip around the country in my trusty old T-Bird. Just lookin', I call it—some of the others around here say I'm out "Rex-ing." At every stop I was met with prompt, efficient service. The people I met on the ramps, in Base Ops and the snack bars knew their business and were going about it in a way that made me proud of each operation I saw.

I was feeling pretty good about the whole trip until I arrived at Canker AFB. I had run out of crew duty, so I had to RON. When I learned what the messing situation was, I wished I had pressed on to another base for the night. The Officer's Mess was closed to transients because the base was holding a dining-in. No one had seen fit to set aside a small area in the club for feeding transients. I expressed my disappointment to the folks in Base Ops, but they assured me there was no problem—both the Flight Line and Golf Club snack bars were open.

Now, I'd been eating in snack bars all day. I was ready for an honest-to-goodness sit-down meal before I went to bed for the night. The Flight Line snack shack didn't look like it had what I was looking for, so I called a base taxi, waited until it arrived, and went over to the Golf Club. Wouldn't you know it? Nothing available there but cold sandwiches.

I gave up and went to town.

The thing that troubled me the most was the Rex Riley certificate, neatly framed, hanging on the wall in Base Operations. ★

REX RILEY
Transient Services Award

LORING AFB	Limestone, Me.
McCLELLAN AFB	Sacramento, Calif.
MAXWELL AFB	Montgomery, Ala.
HAMILTON AFB	Ignacio, Calif.
SCOTT AFB	Belleville, Ill.
RAMEY AFB	Puerto Rico
McCHORD AFB	Tacoma, Wash.
MYRTLE BEACH AFB	Myrtle Beach, S.C.
EGLIN AFB	Valparaiso, Fla.
FORBES AFB	Topeka, Kans.
MATHER AFB	Sacramento, Calif.
LAJES FIELD	Azores
SHEPPARD AFB	Wichita Falls, Tex.
MARCH AFB	Riverside, Calif.
GRISSOM AFB	Peru, Ind.
PERRIN AFB	Sherman, Tex.
CANNON AFB	Clovis, N.M.
HICKAM AFB	Hawaii
LUKE AFB	Phoenix, Ariz.
RANDOLPH AFB	San Antonio, Tex.
ROBINS AFB	Warner Robins, Ga.
TINKER AFB	Oklahoma City, Okla.
WETHERSFIELD AFB	England
HILL AFB	Ogden, Utah
YOKOTA AB	Japan
SEYMOUR JOHNSON AFB	Goldsboro, N.C.
ENGLAND AFB	Alexandria, La.
MISAWA AB	Japan
KADENA AB	Okinawa
ELMENDORF AFB	Alaska
PETERSON FIELD	Colorado Springs, Colo.
RAMSTEIN AB	Germany
SHAW AFB	Sumter, S.C.
LITTLE ROCK AFB	Jacksonville, Ark.
TORREJON AB	Spain
TYNDALL AFB	Panama City, Fla.
OFFUTT AFB	Omaha, Nebr.
ITAZUKE AB	Japan
ANDREWS AFB	Washington, D.C.
McCONNELL AFB	Wichita, Kans.
NORTON AFB	San Bernardino, Calif.
BARKSDALE AFB	Shreveport, La.
HOMESTEAD AFB	Homestead, Fla.

RESPONSIBILITY

Lt Timothy R. Gavin, San Francisco

I noted the difficulty but not the danger



FROM THE BEGINNING of my Air Force career I have been drilled in the concept of responsibility. I have always thought I knew exactly what responsibility meant, and I have never seriously doubted my ability to handle any job "responsibly."

A recent mishap has made me re-evaluate my outlook on the subject of responsibility, and I hope my thoughts will initiate some new thinking on the part of any supervisor who is charged with, or claims to possess, responsibility.

The event I'm referring to was an accident which may cost the injured airman the sight of an eye.

Our unit is a small enroute maintenance detachment handling cargo aircraft. The day of the accident began normally. We had an aircraft early in the morning and blocked it without incident. I checked the schedule for the remainder of the day and assured myself that we had no aircraft inbound. I had been waiting for a break in the schedule to rearrange the office furniture and finish building a unit picnic area. It looked like an excellent opportunity to get the jobs done.

Work in the office required removal of a plexiglass chart from the wall. After taking off the frame we discovered the original installation of the chart was made by pounding nails through the pre-drilled holes in each corner. Removing the nails was difficult. No one could seem to find a claw hammer and an airman working on the chart was using a screwdriver—forcing it under the plexiglass and trying to pry up the nail in that manner.

I noted the difficulty but not the danger and left the office to find a hammer. I was only a few feet from the office when the airman called me back. When I turned around I saw that he was holding a hand over his eye and saying he should go to the hospital.

On the way over he told me that when he pried up the corner of the chart, a small piece of plexiglass splintered from the chart and lodged in his eye. The rest of the story is in the hospital report. "Airman received a laceration of the cornea of the left eye . . . prognosis for return of normal vision is poor . . . recommend airman be returned to the United States for specialist care . . . possibly a corneal graft."

This accident shocked every member of the detachment. The obvious lessons were impressed on everyone involved. I don't think the dangers of working with plexiglass or the need to use the right tool for the right job will need re-emphasis very soon.

As a supervisor, I have examined my conscience more deeply than perhaps the other members of the detachment. From the moment I saw the airman with his hand over his eye, I knew I had blundered

and I knew exactly what I should have done. But why didn't I react?

I believe my mistake was not simply that I neglected to stop the unsafe act but, rather, a kind of creeping complacency toward exercising my responsibility. Most supervisors at one time or another experience this type of complacency. How often have you walked by someone who was doing a job halfright or without proper safety equipment or TOs and not said anything? It may have bothered your conscience, but still, for some reason that probably wasn't very good, you simply didn't do anything.

If I were to ask you now if you think you are a complacent supervisor, I'm sure I wouldn't get a "yes" answer. If someone had asked me that question the day before the accident, I know I would have answered an unqualified "no." Today I am a little more self-critical. Complacency is tremendously dangerous to any supervisor simply because most of us are unwilling to admit to ourselves that it may exist.

To me the real measure of the supervisor is his ability to "exercise" his responsibility. Like taking care of your body; if you don't exercise it, sooner or later you will pay the price in terms of your health. Likewise, if you fail to exercise your responsibility and are simply "carrying" it, ultimately the price will be paid, and in all probability, in much more tragic proportions. ★

LOST and DOWNED

BRIEFS OF RECENT AIRCRAFT ACCIDENTS

C-130 Four minutes after departure the crew transmitted that the wing was on fire and that they would have to ditch. Observations from another aircraft indicated smoke coming from the wing area, that one engine was shut down, and the aircraft appeared to be in a ditching configuration. The aircraft was seen to touch down and hydroplane for approximately 70 yards then disappear. Preliminary investigation indicates possible materiel failure in the bleed air system.

C-119 Immediately after takeoff, pilot notified tower that an engine was failing and that he would climb straight ahead and return for landing. Aircraft was not able to climb even though the propeller was feathered. Landing gear was retracted at impact; however, there is a strong possibility that retraction time was prolonged due to an engine being shut down. It appears that the pilot had to sacrifice altitude to maintain single engine climb speed, but ran out of altitude.

Twenty feet of wing was broken off when the wingtip struck a dike. Aircraft then crossed a ditch and began to break up. There were two survivors among the eight crewmembers. COMMENT: An intensive program is underway to improve reliability of overhauled R-3350-89 engines. In the interim, takeoff gross weights are being limited to insure single engine climb capability.

C-47 Aircraft was landing after a SEA support mission. A normal touchdown was immediately followed by a swing to the left. This was controlled by the pilot but a further left swing could not be held. Aircraft left the runway, struck a small mound with the left wheel and came to rest on its nose and main gear. Examination revealed that there was a hole in the wheel rim around the tube stem, dye penetrant checks revealed further cracking of the rim, and it appears that (unknown to the crew) the left tire deflated during flight. Other interesting factors:

- There had been four flat tires on the subject wheel during the preceding ten weeks;
- Pilot occupying the right-hand seat did not have his shoulder harness fastened;
- Flight mechanic was standing between the pilots' seats for the landing and not seated and strapped in.

F-106 During an ORI an F-106 pilot was attempting a night, over-water, low-level intercept against a T-33 target. The target was flying at 1500 feet, emitting chaff. The F-106 pilot flew into the water in his attempt to hack the intercept. ★

A-7D

a good honest bird, reliable and tough if you let her do what she's designed to do

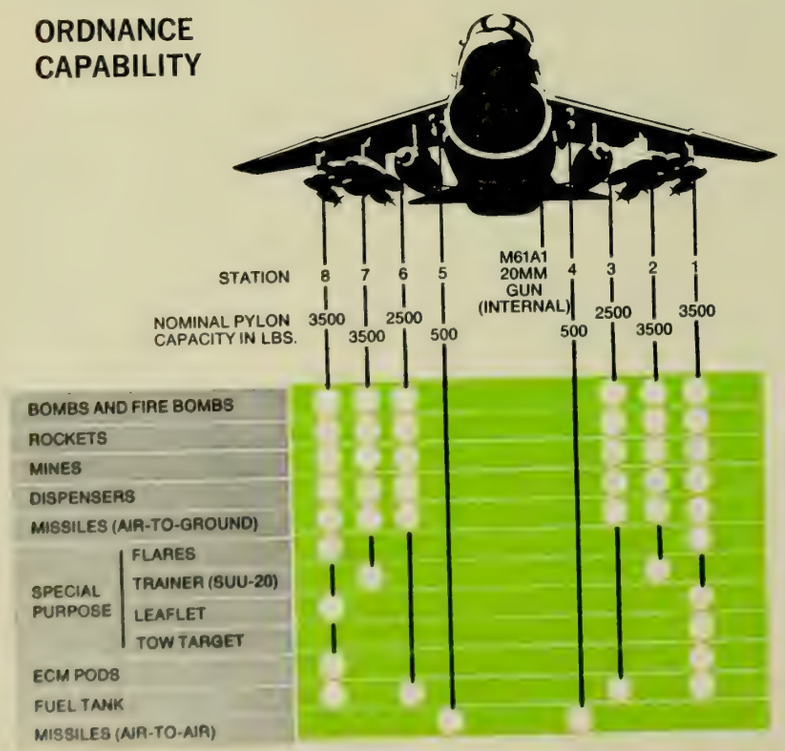
In the past the Air Force has made fighters out of bombers, bombers out of fighters—in short, made one airframe do a mulit-mission job. In many cases the results have been "fair" for both missions. Now happily, we have a new trend. Our in-the-mill F-15 is promised as an air superiority fighter to clear bogies from overhead, while down below, Brother Corsair will do the job of dropping bombs and shooting guns in an attack role.

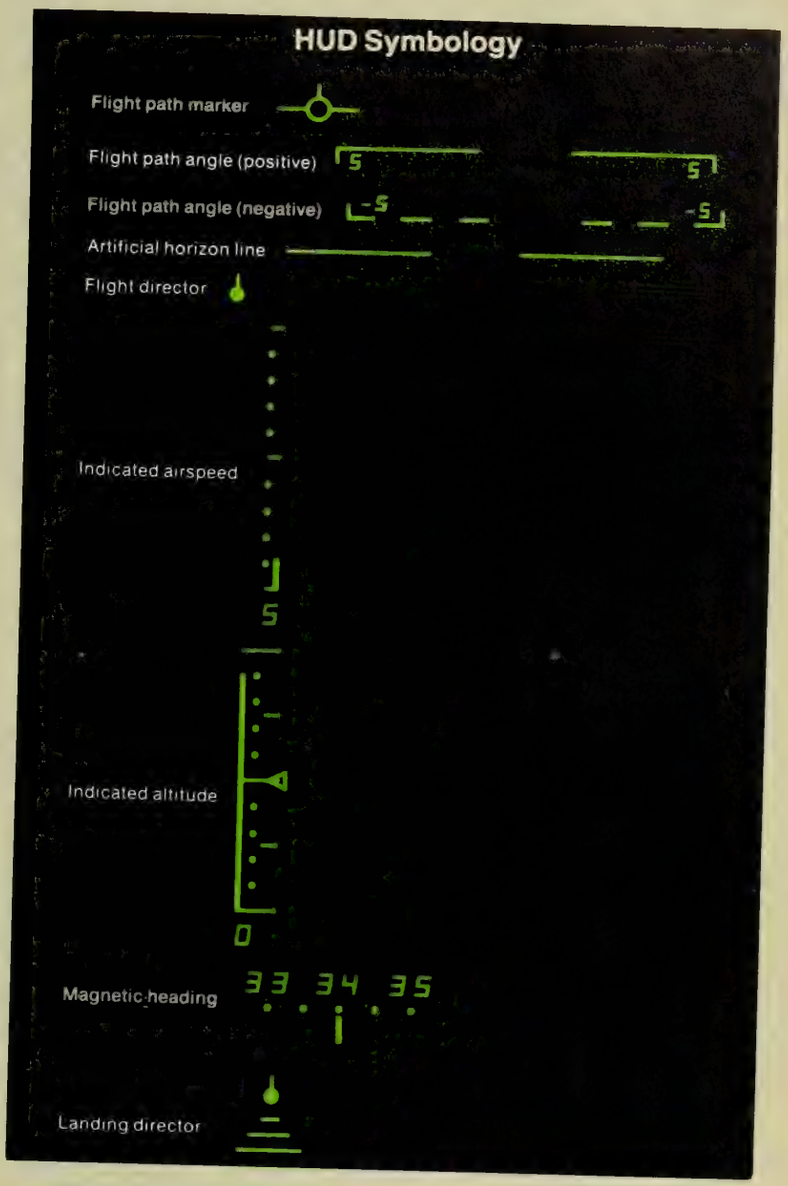
IT'S MUSIC TO OUR EARS when we hear the Head Honcho say, "She's a good, honest bird, reliable and tough if you let her do what she's designed to do—fill the attack role." To find out what the jocks think of the A-7D we took a trip to Luke to get the straight skinny. Lt Col Bobby Bond, Commander of the 310th Tactical Fighter Training Squadron, and all his boys like the bird! So that everybody will have a feel for what's coming up in the way of hardware, we'll discuss some of the capabilities, characteristics and systems of the Air Force version of the A-7.

To begin with, the A-7D is not the same bird as the Navy A-7A/B. We required some basic changes which were:

- Increased thrust: 14,250 versus 11,350
- Improved ordnance delivery error (from 20-10 mil)

ORDNANCE CAPABILITY

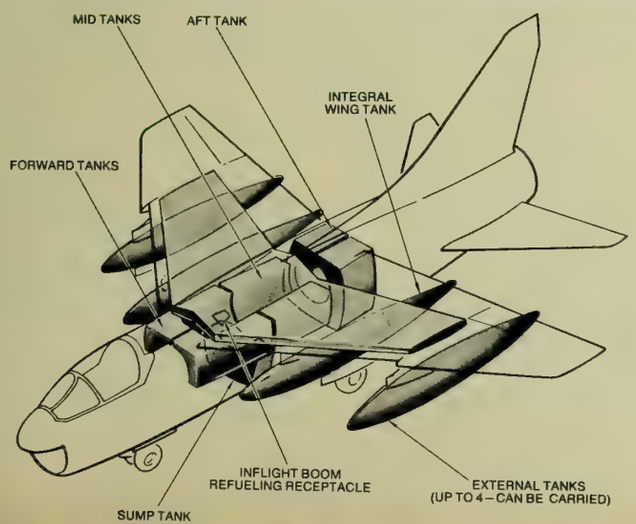




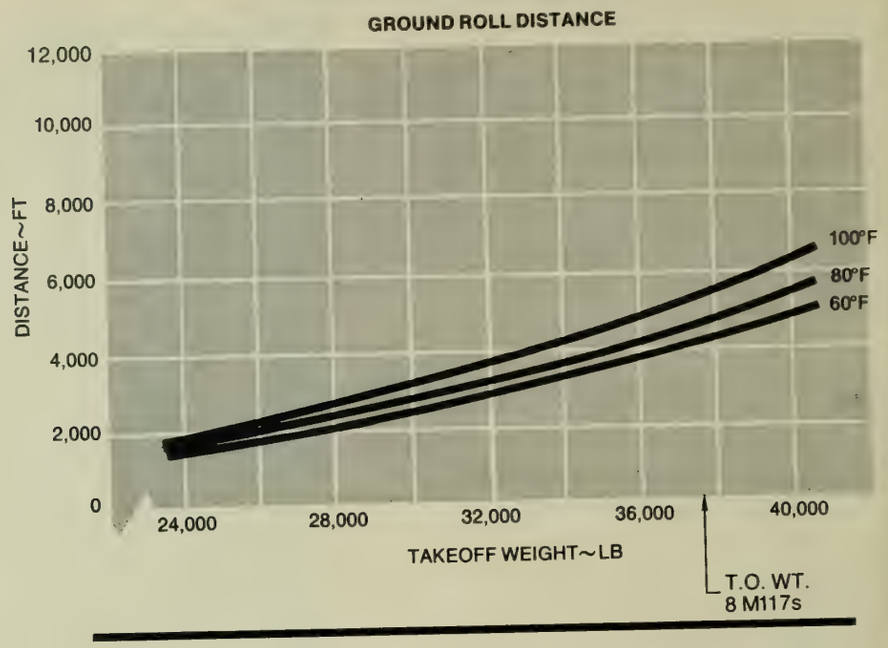
- A receptable for air refueling boom
- An avionics package improved to provide:
 - integrated bombing and navigation capability.
 - heads-up display (HUD)
 - tactical computer
 - projected map display
- An increased survivability package of:
 - all foam-filled fuel tanks
 - three separate power control systems
 - back-up controls, system redundancy
 - extensive ceramic and steel armor
 - ECM
- A 20mm M61-A-1 gun
- An antiskid brake system.

FUEL SYSTEM

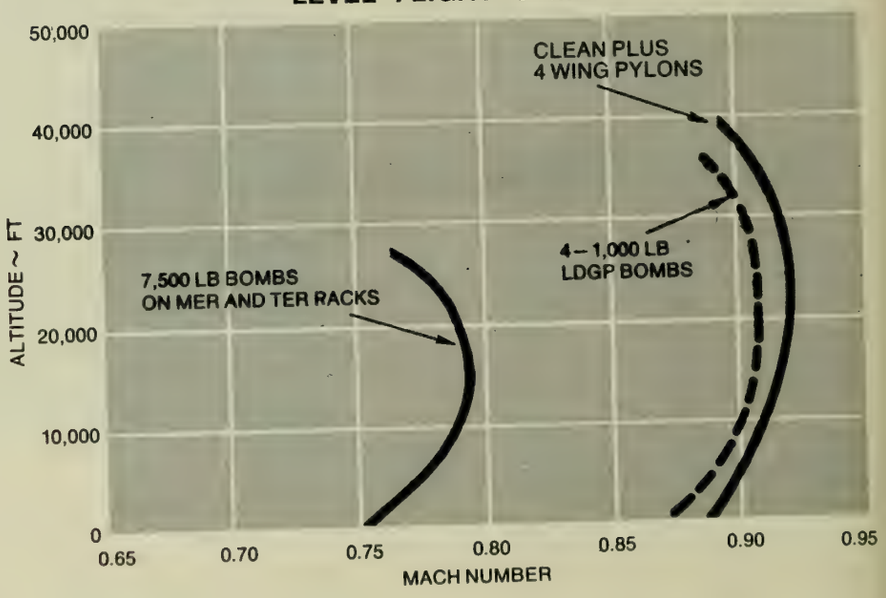
Looks like a winner. It has no moving parts. Ejector-type fuel pumps transfer fuel from the wing and aft cell into the sump cell. This sump plus the lower one-third portion of the aft fuselage cell are self-sealing and give the pilot a hip pocket 300 NM of gas in the event of damage to the rest of his system. Total internal fuel available is a bit over 9500 lbs. It's enough, so the troops at the squadron say, to fill 'er up once in the morning and fly all day long. A jettisoning feature is available to get rid of all wing fuel



TAKEOFF PERFORMANCE



LEVEL FLIGHT V MAX



A-7D

CONTINUED

(720 gallons) by gravity flow within 7.5 minutes.

ESCAPE SYSTEM

The bird has an improved escape system which includes an automatically deployable survival kit and a ballistically initiated canopy jettison. The standard face curtain and between-the-legs D ring are used to initiate the sequence. The limits are 0-650K and from 0-50,000 feet.

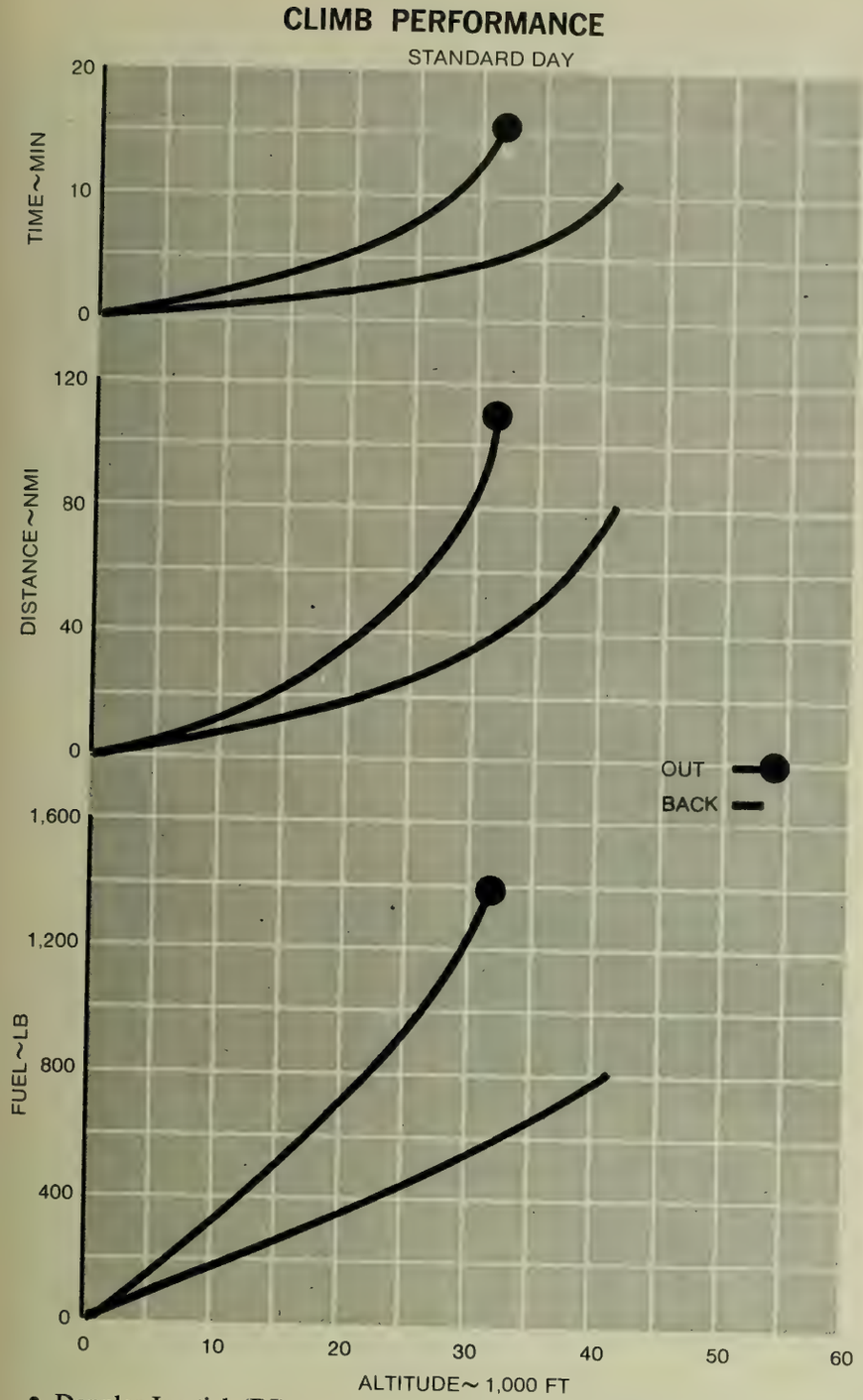
PERFORMANCE

To give you a feel for how the A-7 goes about its mission, we've reprinted some simplified takeoff, climb data, and level flight V max charts which indicate that even without A/B it's not exactly a hog.

NAVIGATION

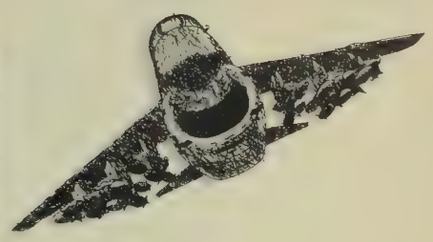
The airplane has four (count 'em —four) dead reckoning nav modes, all dependent on sensor availability. They are:

- Doppler-Inertial Gyrocompassing (DIG)



- Doppler-Inertial (DI)
- Inertial
- Doppler/Air Mass

Doppler-Inertial is the primary navigation mode; automatic change over to backup navigation modes occurs in case of navigation sensor failure. The navigation systems will automatically assume, or can be manually selected to, a pure inertial mode if the Doppler is unreliable. The Doppler/Air Mass mode will be assumed automatically if the Inertial Measurement System fails. If the air-data computer fails, the latter mode will continue on Doppler data and magnetic heading. If the Doppler fails, the mode will use true airspeed, magnetic heading and last computed wind from storage.



RADAR

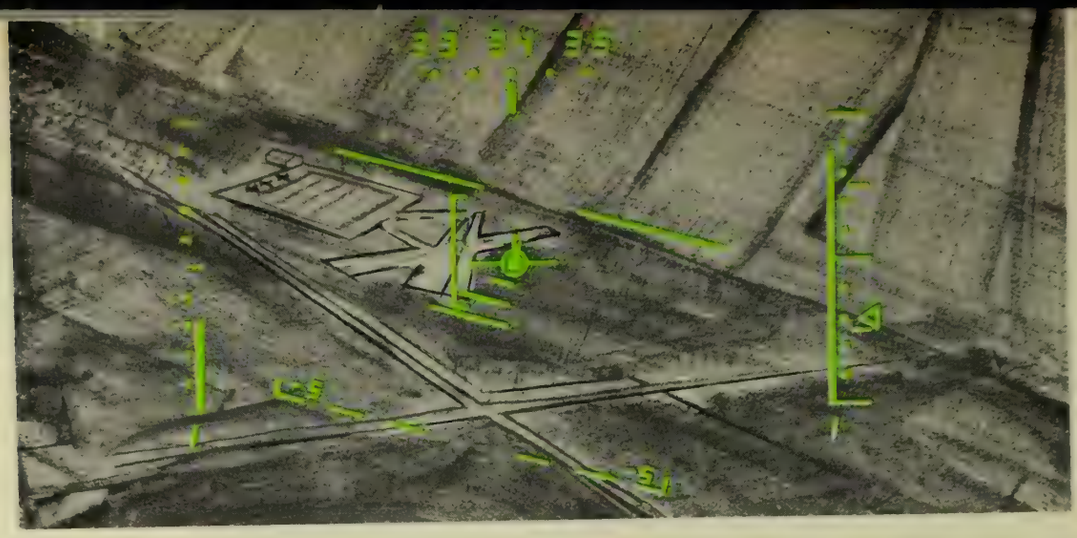
Equipped with FLR (forward looking radar) the A-7D is capable of high or low altitude mapping, low altitude terrain following, low altitude terrain avoidance, air-to-ground ranging plus two cross scan modes which allow simultaneous terrain following and terrain avoidance or terrain following and low altitude mapping. For terrain avoidance, clearance altitudes can be programmed for 200, 500, 1000, 1500 and 2000. Also built into the set is beacon interrogator for Ku band beacons. This feature also gives range and azimuth to the beacon.

THE HUD

This isn't a revival of an old movie—it's, according to the A-7 jocks, magic. How many times have you been on final for an approach to a 200½ ceiling and wished you could ignore the gages and just look for some solid concrete? Well, it looks like the HUD (heads up display) has just solved this little dilemma for us. In effect, this gadget takes all the necessary information from the flight instruments and displays pertinent data at eye level (similar to the gun sight). The display is transparent, focused to infinity, and optically merges to become part of the pilots forward view. We have reproduced the HUD symbology and a typical HUD landing display to show you what information you, as an A-7 driver, can expect to see. We in the safety business welcome the HUD as a real break-

A-7D

CONTINUED



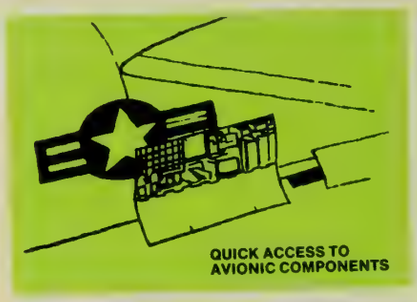
LANDING PHASE

through in eliminating the crossed eyes method about the time you expect to go visual on an instrument approach. It eliminates the eyes bouncing from gages on the panel to windscreen. In addition to the landing mode the HUD is used for attack and enroute navigation.

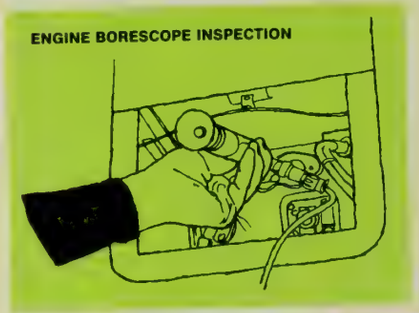
PAY LOAD

Since we have identified the A-7D as an attack weapon, the accompanying load configuration chart shows various ways to hang the business equipment. Another good feature is that the aircraft has a respectable radius of action even when max grossed. This coupled with an improved target accuracy factor (10 mils vs 20 mils) means that for a 95 per cent Pk you need only one-third the number of sorties to clobber a target. Good news if you're the one laying it on the line.

Far from being a needle nosed fighter, this bird promises to be a real work horse. It looks to us and to the troops flying her that the A-7D will perform "as advertised." ★



QUICK ACCESS TO AVIONIC COMPONENTS



ENGINE BORESCOPE INSPECTION

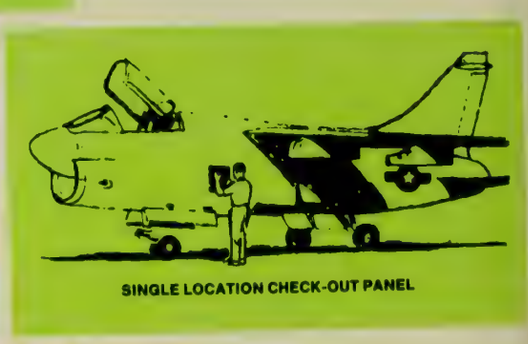
MAINTENANCE FEATURES

The A-7D was designed and engineered to facilitate maintenance and to keep turnaround time at a minimum. These features include:

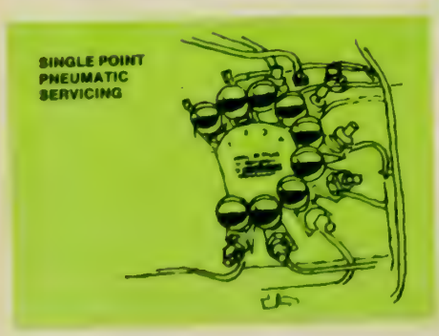
- Single locaton checkout panel for: voltages, phase checks, flap indication circuit
- Waist-high gun, both for maintenance and loading
- Built-in hand pump for all utility hydraulic systems
- Built-in phase sequence light for external power
- Simplified servicing of liquid oxygen system
- Fast access to avionic components
- Single location for pneumatic servicing
- Simplified system for refueling and defueling
- Single oxygen converter with easy access for filling in place or for quick removal for filling or maintenance.



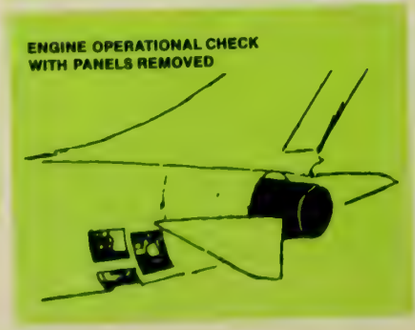
BUILT-IN HAND PUMP ALL UTILITY SYSTEMS



SINGLE LOCATION CHECK-OUT PANEL



SINGLE POINT PNEUMATIC SERVICING



ENGINE OPERATIONAL CHECK WITH PANELS REMOVED

Ops topics

SHORT BURSTS FOR OPERATORS

FROM AN OHR

". . . Shortly after starting, I removed the seat safety pin. I always visually check the pin after removal. On this occasion inspection showed that the outer housing of the pin shaft separated at the neck leaving the outer housing still in the seat. The inner shaft and pin handle extracted normally. Had I taken off with this condition, the ejection seat would have been inoperative."

This one occurred in an F-106, but it could happen anywhere that this type of ball-lock pin is used. The unit involved in this incident inspected the rest of their aircraft and found three more seat pins with loose shafts.

The lesson, of course—LOOK at the pins after you pull them.

A few EURs have been submitted on this condition —it usually is the result of age and wear. On some aircraft the Dash 6 now includes a specific check of all ball-lock pins. If it isn't part of the inspection requirements for your aircraft, how about firing in an AFTO 22?

B-57 DISASTER

Following a simulated flameout pattern, the pilot of the B-57 planned a low approach, but when he added power the aircraft continued to sink. It touched down on the overrun 650 feet short of the runway, became airborne again for 1300 feet and touched down again in a violent rolling pitching movement. The bird left the runway on a collision course with Base Ops. It veered to the right slightly, passed between two rows of parked aircraft, and struck three military vehicles and two loading stands. An explosion followed. The vehicles were destroyed and the front of Base Ops was damaged.

After disconnecting from the seat, the front seat pilot attempted to blow the canopy by raising the right arm rest. The seat went along with the canopy, launching the pilot 30-40 feet in the air.

Score: student pilot—major injuries; pilot—third degree burns; A1C—fatal; fireman—minor cuts; three vehicles and two passenger loading ramps destroyed; B-57 destroyed; damage to Base Ops.

Primary Cause was *Supervisory Factor* in that the IP allowed the pilot to stall the aircraft during the low approach following an SFO pattern.



TOO MANY POUNDS

An OHR points up an age-old problem that still pops up from time to time. This time a KC-135 was loaded with cargo manifested at 9000 lbs. Prior to loading, the aircraft was at max takeoff weight so the fuel load had to be reduced by 9000 lbs. It wasn't long before the pilot realized that the aircraft was not performing normally for the computed weight. Then during landing approach the speed deviation pointer in the flight director system indicated slow, making it necessary to increase pattern and approach speed.

If you guessed that the cargo weight was erroneous you are right. Instead of 9000 lbs, it weighed 13,700 —a little matter of 4700 excess pounds. This is one area where the flight crew is strictly at the mercy of the cargo handling crowd. No pilot or loadmaster can eyeball a crate—or whatever—and accurately guess its weight. Organizations responsible for cargo handling and manifesting must insist on accurate manifests showing precise weights. Failure to do so has and will no doubt continue to cause accidents.

Ops topics

CONTINUED

A-7 OIL FILLER CAP

On runway prior to takeoff, wingman noted heavy vapor mist coming from aft port side of section leader's aircraft. Leader aborted, taxied clear of runway and secured the engine. Investigation revealed that the oil filler cap was not properly installed while failsafe door would close.

The aircraft was received new with the oil filler cap security assembly out of adjustment, allowing the door to be closed with the cap improperly installed. If the wingman had been positioned on the opposite side of the subject aircraft, the oil loss might have gone undetected and a very serious situation might have developed shortly after the aircraft became airborne.

Recommend that pilots and support personnel inspect the oil filler cap very carefully prior to each flight.

(U.S.N. CROSSFEED)



GEAR GRABBER

When the T-Bird taxied in from an FCF, the crew chief noticed fuel leaking from the underside of the left tip tank. Checking closer, he saw that the bottom of the tank was dented and scraped. Getting curious, he looked the bird over and found the bottom edge of the left main gear door was scraped, too!

The pilot had been unaware of any unusual occurrence during the flight that could have caused the damage. The strange part of it was that there was no way the gear door could have been scraped like that unless the left tire was deflated, and it wasn't! That is, if the gear was down and locked.

Now, if the pilot had started the gear up before the bird was really airborne----

But there's more to this one:

The pilot was qualified in both the T-39 and the T-33. And the T-39 rushes right off the ground when you rotate for takeoff. Not so the trusty old T-Bird. Maybe some habit interference?

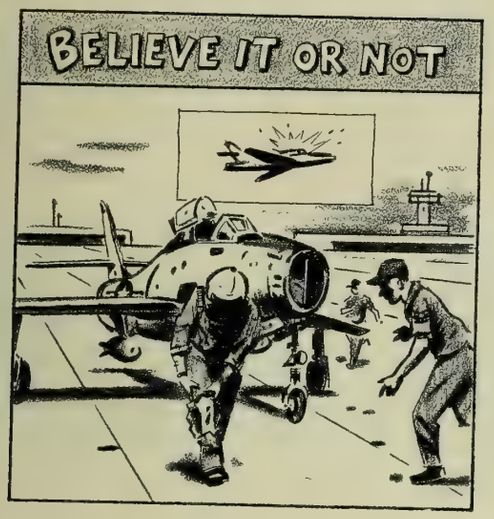
'Specially on these hot summer days—and in any airplane, old or new—it makes real good sense to be *double* sure the bird's flying before you grab the gear.

GEAR DOWN AND CHECKED?

Maj Leland P. Kriner, Directorate of Aerospace Safety

After completion of several practice instrument approaches, the pilot of an F-84F commenced his landing approach. When the aircraft was two miles out on final, the runway supervisor observed that the taxi light was not illuminated and asked the pilot to recheck the position of the landing gear. The pilot replied that the gear was down and locked. Shortly thereafter, the aircraft skidded to a halt resting on the external fuel tanks. Fortunately the pilot was not injured and the aircraft damaged only slightly. With all that help . . .?

Regrettably, this type of human error is not an isolated case. Much too recently, this mistake was duplicated with an F-4 and an F-105.



RIPLEY WOULDN'T BELIEVE IT

Maj Leland P. Kriner, Directorate of Aerospace Safety

An F-84F jock was peacefully cruising along when he noticed a hairline crack appear in the glass of the fuel quantity gage. A short time later, the glass fogged and obscured the indicator. Then, the gage exploded and glass hit the pilot's knee. There are a couple of lessons to be learned from this incident. Don't get your face too close to a damaged instrument and put your visor down if it becomes necessary to closely scrutinize the instrument. Fortunately, the pilot was not injured and the aircraft was recovered safely. The cause of the failure is being investigated.

If any of you have any "Believe it or not incidents," *Aerospace Safety* would like to hear of them.

SCRA-A-APE

It was the first transition flight of an in-country checkout in the O-2, and the pilot and IP had gone over to a nearby field and flown several practice landings. After they ran through some airwork, they returned to the home drome for some more landings. The fourth was to be simulated rear engine out, and when they retarded the rear engine throttle the gear warning horn sounded. The pilot silenced it by depressing the gear warning light.

Abeam the landing point on downwind, the pilot put the gear handle down. And then, just after he started a left turn to base leg for the left-hand runway, he was instructed by the tower to land on the right-hand runway. He continued his base leg, turned final for the correct runway, and proceeded down to the flare.

That was when the IP looked out his side of the airplane and saw that the gear wasn't down. Although he took over immediately, pushed both throttles to the wall and went around, he couldn't avoid nicking the runway with the rear propeller and scraping about an inch off the bottom of each of the rear gear doors.

Airborne, and breathing again, they found that the gear handle was in the DOWN NEUTRAL position instead of full down. And the yellow gear in-transit light was illuminated.

It's a too-often repeated story: warning horn deactivated, unexpected interruption in the landing pattern sequence, checklist interruption and—SCRAPE!! ★

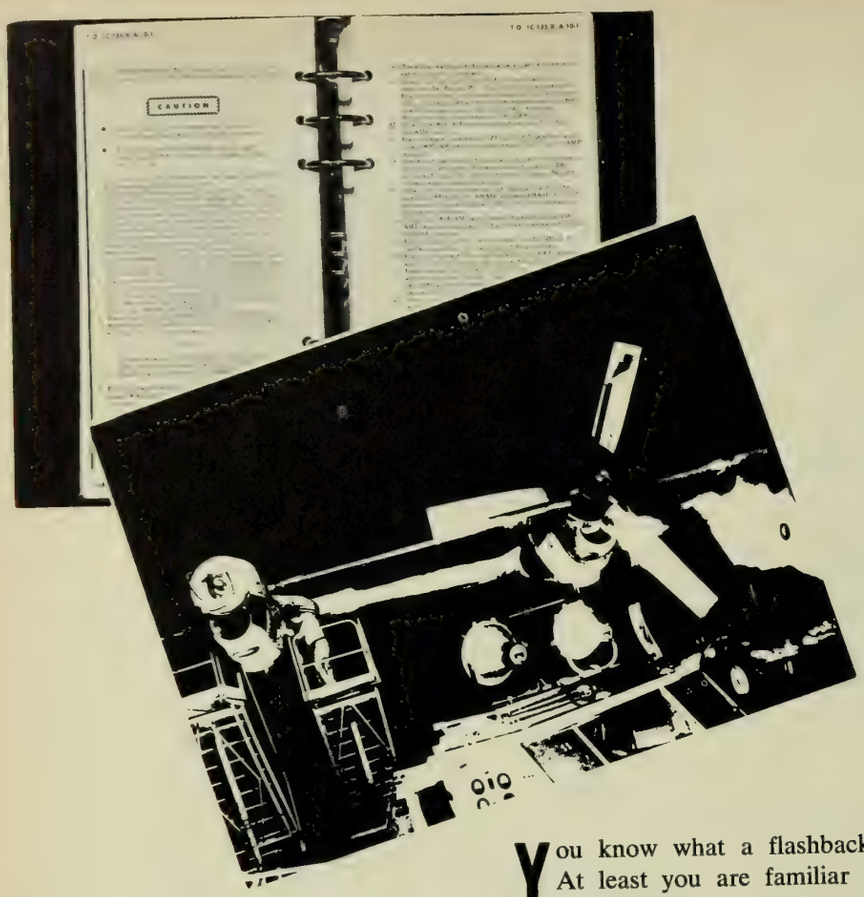
FLIP CHANGES

Special operating procedures are to be observed with the creation of the Atlanta Terminal Control Area (TCA) effective 25 June 1970. See: FLIP Planning N & S America, Section II; Low Altitude Chart—U.S., L-20 and the Atlanta Terminal Area Chart, 25 June 1970.

New Radar Beacon Codes for VFR flight and the use of Area Navigation equipment will become effective 1 July 1970. See: FLIP Planning, N & S America, Section II, 25 June 1970.

The FAA has established new Abbreviated IFR Departure Clearance Procedures effective 1 July 1970. See Special Notice in FLIP Planning, Section II, N & S America and the Pacific, Australia and Antarctica Editions, 25 June 1970.

Effective 25 June 1970, High Altitude—Single Direction Routes will be graphically depicted on the FLIP Enroute High Altitude Charts—US. ★



FLA

You know what a flashback is. At least you are familiar with the technique if not the words. The flashback is an interruption in movies and stories to illustrate something that occurred before the present.

Like right here we want to talk about checklists. And we want to get you involved so you'll read the whole story. So we throw in something that happened in the past to illustrate the point we're trying to make now. For example, we could tell you about the sergeant who was recalled to duty from standby status to install the rear seat bucket in an F-4. Apparently he was in a hurry and did not install the safety pins. Also the job calls for two men and the sarge was trying to go it alone. The sad result was that the rocket motor ignited and the bucket struck him, causing instant death. His checklist was found in his unopened tool kit.

End of flashback; back to the present. You probably hear a lot about checklists and have asked yourself several questions: Who uses checklists? What good are they? Is it necessary to use one on every job? Why must I follow it step by step?

You old heads are probably thinking, here we go again on a checklist lecture. If that is your attitude, the least you can do is try to persuade the younger airmen to read this whole article. It won't be long and it just might save a life or an airplane.

Let's proceed by answering the questions stated above. And maybe we can slip in a few flashbacks to nail down the crucial points.

• *Who uses checklists?* Every maintenance man when working on an aircraft or associated equipment should be following either a checklist or a tech order.

• *What good is a checklist?* We could talk about things you have forgotten at the commissary or BX, but let's stick to the job where you can't afford to forget something. Like a Tech and his Sgt assistant. They were running a functional check of the barrier hook on an F-105. The Tech in the cockpit was directing the operation but he failed

SHBACK

to require audible responses from his assistant back in the tail. The man in the tail moved right along through several steps to installation of the explosive bolt. Then the Tech Sergeant in the cockpit depressed a button which energized the explosive bolt circuitry. Since the man in back had the bolt in his hand, you can imagine the rest.

If these two had been following the checklist together . . . well, you take it from there.

Here's one that sounds like it came out of a Keystone Cop episode. Only it was ninety thousand dollars serious. A TF33 engine broke loose from a test stand and traveled 286 feet. Yep, "failure to comply with the TO."

• *Is it necessary to use a checklist on every job?* TO 00-5-1 says that we will operate and maintain our machines by the use of TOs. It also recognizes that some tasks do not require checklists. Nevertheless, we're going to answer this question with a *yes* and trust you and your supervisor to know when to use or not to use a checklist. Even though you know your job thoroughly, our equipment today is so complicated and the results of a mistake so drastic that it just makes sense to use every bit of smarts available to do the job right—even using a checklist. Not only will it help protect you, in case of an interruption or if your mind wanders a bit, but it will also protect the guy who will be driving that bird and maybe some crew and passengers.

• Final question, *"Why must I follow a checklist step by step?"* Some checklists are designed so that if you miss a step you can't go on to the next one. For example, if step four calls for turning on the power and step five is checking a light, obviously there won't be a light unless step four was complied with.

The first item on most checklists is check *the aircraft forms.* You might get away with servicing LOX, for instance, for years without checking the forms. On the other hand, you might blow up the next bird you try to service.

Now, let's flash back again to some incidents that should cinch our case. See what you think.

An F-4 lost a door in flight which caused damage to an AIM-7 missile. Maintenance did not follow the checklist and improperly installed the door.

An F-101 pilot had to shut down Nr 2 because of loss of oil pressure. When installing the CSD someone neglected to use a clamp on the oil line as called for in the TO.

A fire warning light caused an O-2 pilot to shut down the rear engine and make a single engine landing. The rear engine fire detection lead was improperly installed and chafed on the exhaust manifold. Another case in which the TO wasn't followed.

The fact that these examples could go on for pages does not excuse the next one. One thing we can be pretty sure of is that anyone who has ever been involved in an accident in which checklist discipline was a primary cause factor will not be likely to make that mistake again. Which brings up the question, "Do we really have to learn the *hard* way?" ★



NUCLEAR SAFETY AID STATION



AGAIN, AND AGAIN, AND AGAIN!

The last issue of the *Nuclear Safety Magazine* carried an AID Station on bent pins. Since that article was written, several reports of bent pins on the reentry vehicle inflight-separation cable have been received. An engineering study is underway to determine the feasibility of redesigning the cable connector to eliminate this problem. However, even if a design change is forthcoming, it will probably be months before the change can be affected in the fleet. In the meantime, technicians and supervisors should place extra emphasis on carefulness when mating electrical connectors.



VIBRATIONS LOOSEN CONNECTIONS

During a commercial power fluctuation at a Minuteman Launch Control Facility, the motor generator coasted to a stop because the back-up DC motor did not pick up the load. Investigation revealed a loose cable connector that prevented the batteries, which power the DC motor, from becoming adequately charged. The cause was attributed to vibration that loosened a connector which had not been properly tightened. Be certain critical fittings are tightened properly.



THE WRONG MOVE

During an ORI, the Deputy Missile Combat Crew Commander inadvertently placed the enable switch in the enable position, thereby violating the weapon system safety rules. An increase in tension during the ORI may have been a contributing factor to the violation. During times of stress and excitement, everyone must exercise extraordinary concentration on and awareness of the task being performed. "Keep your cool."

CONTINUED



NUCLEAR SAFETY AID STATION



TOO CLOSE FOR COMFORT

When a civilian vehicle ran a stop sign in front of a slow moving R/V convoy, the escort vehicle stopped suddenly to avoid a collision. The R/V van following tried to stop, but ice on the roads prevented adequate traction. A sprained neck and damaged bumper were the results. The absence of major injury and damage are attributed to the slow speed of the convoy, but obviously slow speed alone is not always enough. Proper lookout and sufficient distance between vehicles must be adjusted for road conditions. Defensive driving will prevent the "other guy" from getting you into trouble.



CHECKLIST PROCEDURES

While loading a B43 on an F-4C centerline, a pull-out cable was damaged. Failure to remove the aft cable fairing cover resulted in the inability to hold the pullout cable out of the way while the weapon was being raised. The oft repeated adage of "follow checklist procedures" still holds.



WATCH THAT NEXT STEP

Recently at two different Air Force bases, individuals who had received appropriate nuclear safety training stepped across the security boundary (red line) into the No-Lone Zone around a B-52 alert aircraft. In one case a man was delivering a battery to the aircraft and in the other a man stopped to check a work stand underneath the aircraft rear hatch. Although neither case was intentional, they caused prompt action by the security personnel. The No-Lone Zone and Two-Man Policy are a vital part of the nuclear safety program. Remember the No-Lone Zone means "stay out" unless properly cleared into the area.

Tech topics

BRIEFS FOR MAINTENANCE TECHS





the maintenance man's life line

When standing on the C-5's horizontal stabilizer, one develops the illusion that the fuselage and wings could easily belong to some other airplane. The tail is so remote that one feels completely separated from the remainder of the aircraft and is merely standing on a large winglike platform 65 feet above the ramp. This is hardly conducive to one going calmly about his business. A slip could mean a fall and that would be disastrous.

This hazard was recognized early in the C-5A design program. Aerospace Ground Equipment Design Engineers, Safety Engineers and Human Factors Engineers therefore developed a personnel restraint kit which provides a safe environment for maintenance men on all upper surfaces of the C-5A.

We won't go into details here. Basically, the kit consists of two tether lines, a harness, braking mechanism and restraint fittings. The latter are inserted into fittings on the upper surfaces of the aircraft. There are 50 of these flush-mounted. In case of a fall, the braking device would arrest the man and he could be lowered by personnel on the ground or by himself by pulling a weighted lanyard operating through pulleys.

Tests indicate that people working on the 65 foot high T-tail will wear the device but that they're reluctant to wear them on the upper surface of the wing. It's lower and bigger so does not seem so hazardous. Nevertheless, a fall from the wing onto concrete could be fatal.

Supervisors must insist that personnel working where restraint is necessary be thoroughly trained in the use of the restraint kit and insist that they use it. ★

(Lt Col Everett E. Rubble, Directorate of Aerospace Safety)

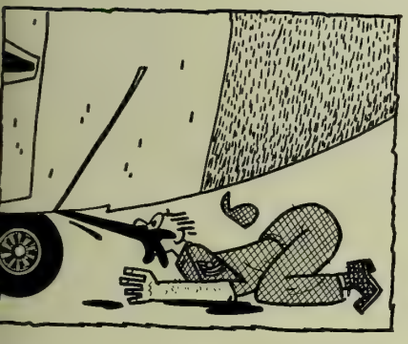
free water limit

What free water limit should be imposed on JP-4 received at the base? This question has resulted in some confusion by base quality control personnel. Although not specifically stated, Section V, paragraphs 5-10 through 5-15 of TO 42B-1-1, implies that 20 ppm is the free water limit on receipt of product from the various transportation modes.

The intent of the 20 ppm limit is to impose restrictions on product downstream of filter separators to insure the filter separator is performing as designed and, of course, to prevent servicing of water to aircraft. Thus the limit should be applied only at fillstands, hydrant pump-houses, refuelers, and hose carts. The procedure for detecting water content of product upstream of these filter separators, which includes receipt, is by the visual technique.

(Aerospace Fuels Digest, SAAMA)





no steering

During taxi for takeoff the nosewheel steering of a C-130 failed and the engineer deplaned to inspect the steering mechanism. When he looked into the nosewheel well he was greeted with a face full of hydraulic fluid from ruptured hydraulic lines. His inspection revealed that both nosewheel steering actuators had pulled out of the fulcrum bearings and several hydraulic lines were broken.

Back on the parking ramp further inspection revealed that two keys were missing from the nosewheel steering bracket (TO 4S3-54-4, fig. 2, index 73). They had either been left out during depot overhaul or by local personnel when they installed power cylinders. Also the lock screw (index 66) for the cylinder mounting plate nut (index 67) had been interchanged with the nose landing gear gland nut lock screw (index 31).

The two screws are identical except that the gland nut lock screw is shorter. When it is installed in the cylinder mounting plate it does not engage the slots in the thread area of the strut. This nut became loose and allowed the steering cylinder support bracket to turn freely since it was not keyed to the strut. This also increased the dimension between the upper and lower cylinder mounts and allowed the cylinders to be forced from their mounts.

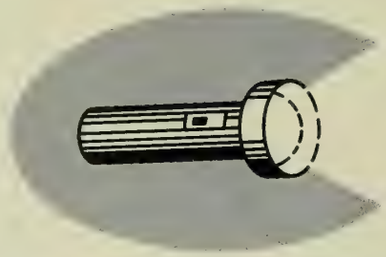
Murphy's law was working overtime here to foil the best intentions of any inspector since the only possible way to detect the wrong lock screws is to remove and inspect them for proper length. An AFTO 22 was submitted to clarify the installation of the keys. ★

quadrant jam

While attempting to adjust the throttles to obtain desired airspeed, a student pilot in a T-38 found that the right engine would not go below 98 per cent. He shut the engine down and made an uneventful single engine landing. When Maintenance investigated they found that an Airloc fastener was lodged between the right main throttle control cable quadrant and its housing. ★

Tech topics

CONTINUED



inventory everything!

The F-4 was scheduled for an early morning launch and, as often happens, the crew chief was conducting his preflight in the dark with the aid of a flashlight. He checked the intakes for FOD and signed them off in the 781. When he got to the left speed brake area, he found a small hydraulic leak. Uncertain whether it was a bona fide leak or just residual fluid, he decided to run an engine to determine whether the system required further maintenance.

Following the engine runup cards carefully, he inspected the right engine intake for FOD again and inventoried tools. With everything in readiness, he climbed into the cockpit. Just as the engine started to accelerate, the man handling the interphone on the ground called that sparks and vari-colored flames were coming from the tailpipe. The crew chief shut down immediately.

Using the ground man's flashlight, the crew chief saw that most of the visible portion of the compressor had been damaged by a metallic object. Later, the engine shop found small pieces of battery in the engine. And the crew chief couldn't find his flashlight. ★



clamp scare

The back-seat pilot in a T-38 was raising his seat from the full down position shortly after engine start, when the M-32 lap belt and man-seat separator initiator fired. With the sound of the explosion, the black smoke filling the cockpit around him, and the butt-snapper slamming him against the stick and the instrument panel, he was sure he was being ejected!

When the smoke cleared, and he recovered from the near cardiac arrest, egress specialists found what had gone wrong. Improperly positioned hose clamps on the oxygen supply line caught on the linkage to the lap belt and the man-seat separator. Fortunately, it all happened on the ground.

Inspection of all T-38s on the field revealed nine others in the same condition, requiring immediate corrective action. ★

the imprint of death

The caption says "One of the most remarkable pictures ever taken." We wish we could show you the photo that caption goes with but we can't. It appeared in a British newspaper—which one is unknown—and shows the imprint of a man's body engraved in the grimy ceiling of a garage. The story that goes with it describes what happened. A mechanic was filling a tractor tire with air when he was called to the phone. He forgot to turn off the air and the pressure in the tire continued to build. When he returned and saw what had happened, he started to disconnect the air supply. That's when the tire blew, propelling him against the ceiling and instant death.

Of course, in the Air Force we cage all high pressure tires every time. Don't we? ★

FOD

Anyone who has been in maintenance very long can tell you that FOD comes in all sizes and shapes and from an untold number of sources. A couple of recent examples will serve to point up that there are different kinds of FOD but that the end effect—an accident—can result from any kind.

An HH-3 helicopter was taxiing out for a scramble takeoff when maintenance men heard a sound that resembled a compressor stall coming from Nr 1 engine. Along with it was a puff of smoke followed by flames in the engine free turbine area.

The pilot, unaware of the situation, continued to taxi until a crew chief ran out to stop him and inform him of the fire. After the engine was shut down maintenance discovered that a rag had been ingested into the Nr 1 engine.

The other incident was somewhat different. An engine on a T-37 got sick and the pilot had to shut it down and make a single engine landing. The cause was found to be oil pump failure due to FOD and subsequent failure of the Nr 2 bearing. The foreign object was a piece of a bearing cage from a previous bearing failure. The system had been flushed but because the PA 661 flushing machine was out of order, pressure could not be used for flushing. Consequently, a half-inch length of bearing housing remained undetected in the system. ★



crossed wires

This item, borrowed from the Navy *Crossfeed,* concerns an age-old malpractice that still crops up frequently, sometimes with drastic results. "During pilot turnup for test flight after engine installation, generator would uncouple when electronic gear was switched on. Maintenance personnel received shocks in wheelwell area.

After many hours were expended on troubleshooting the system and component changing, the problem was diagnosed as improper wiring between generator and D.P.U. current transformers. Wires to T302 and T303 were crossed causing proper wiring of T5 and T6 at generator to be ineffective. System functioned before engine change because T5 and T6 at generator had also been crossed to conform to improper wiring of D.P.U." ★



another taxi tangle

While taxiing out of the chocks, an F-106 crumpled its left wingtip on an MA-3. Prior to the incident the pilot had made a walkaround but had not noticed the MA-3, nor did the crew chief notice the hazard.

A crunched wingtip is usually regarded as a minor annoyance, but it costs money to repair, takes time and manpower and temporarily grounds an airplane. Occasionally it can lead to a major accident. These are reasons why we can't afford "fender benders" with airplanes on the flight line. In this case, the pilot should have been more observant. The crew chief certainly should have taken note of the parked unit and directed the pilot around it or had it moved. The third culprit was the supervisor who allowed the MA-3 to remain parked on the ramp after it was no longer needed. ★

EXPLOSIVES SAFETY

for munitions, weapons, and egress techs

SOMETHING NEW IN EXPLOSIVES ACCIDENTS

Most of us in the explosives safety business believe that we are either familiar with, or have heard of all conceivable types of explosives accidents. Most accidents are variations of ones which have occurred previously. But here's one that almost qualifies as a new type accident.

A tire repairman was engaged in repairing 12 ply tires from "M" series tractors. During the inspection of one tire, he discovered a cylindrical foreign object sticking in the tread. He attempted to pull the object out, but it wouldn't budge. He then attempted to drive the object through the tire and remove it from inside. He struck the object once with a steel hammer and nothing happened. When he struck the object the second time, it detonated, seriously wounding him, and a fragment punctured the leg of another man who was in the vicinity.

The foreign object was a 20 mm HE projectile.

Now you people in the tire shops have something else to look out for. When vehicles are operated in munitions areas or combat conditions, be alert to the possibility of contamination of tires by explosives items.

(George W. Williford, OOAMA.)

EXPLOSIVES SOUVENIRS

Unauthorized explosives taken (and left) aboard aircraft by passengers continue to be a headache. The primary reason, of course, is the hazard they present. Also a great deal of time and manpower are consumed in investigating the circumstances for preventive purposes.

When a certain type of practice grenade was found on a C-141 recently, many people had to devote valuable time tracking down the source, a very difficult task. The Wing safety folk first contacted an army installation where the aircraft had supported an exercise. This particular device was not used in the exercise and the installation had no record of having received or used this munition.

Next they checked with the ammunition plant and found out where that lot number of the munition in question had been distributed. But aircraft records for five months showed no flights to the country where these munitions had been shipped. However, on two recent missions from an overseas base passengers were manifested from where the grenades had been used. It was assumed, therefore, that one of them could have carried the grenade aboard the aircraft—probably as a souvenir that the individual had second thoughts about.

Further checking with the overseas ammo depot nailed down the exact location of this explosive in six units. They control the issue by count and shakedown inspections after range use. They also run a shakedown prior to PCS. Still explosive devices get through and are later found on aircraft.

Sometimes customs inspections turn up explosives, as when several flares were found recently in an individual's hand baggage. Undoubtedly, though, some explosives get home with individuals returning from overseas and frequently we see the results in casualty reports or newspaper stories.

Overseas stations must continue to brief passengers on the hazards of carrying explosives and of leaving them in aircraft. "Last Chance" boxes for disposal of these items should be prominently placed and marked and all passengers informed as to their location and function.

PAD PROBLEMS

Accidental firing of propellant actuated devices (PAD) continues to be a major problem associated with Life Support Equipment. In practically every instance where the cause could be determined, the accident has been due to circumstances which can be classed as avoidable. Here are the most frequent causes:

• Use of unserviceable safety pins, improper installation of pin, or failure to install initiator safety pin prior to working with or near the egress systems.

• Personnel errors in component installation.

• Inadequate supervision.

• Lack of familiarity with the Life Support Systems due to inadequate training.

• Entanglement of red streamers attached to safety pins.

• Cross connection of flexible hoses.

• Flexible hose not connected to applicable propellant actuated device.

• SOPs and checklists not adequate and/or enforced.

• Safety pins improperly attached to streamers.

To reduce the number of these accidents will require the efforts of everyone right down the line from commanders to life support supervisors to the men actually doing the work. The following procedures are offered as basic guidelines to your Explosives Accident Prevention Program:

• Prepare step-by-step checklists and use them to insure that proper procedures are followed during ejection seat and canopy removal and installation, disarming and arming of life support systems.

• Supervise removal and installation of aircraft seats, canopies and other life support equipment on aircraft equipped with egress systems.

• Perform a thorough and searching inspection of the seat and canopy ejection/extraction system at each periodic inspection required by Tech Data and other current directives.

• Assure that an aggressive on-the-job training program is pursued to maintain a sufficient number of egress and maintenance personnel qualified to perform maintenance systems.

• Assure that familiarization courses are established for all egress life support and maintenance personnel.

(John H. Kawka, Directorate of Aerospace Safety)

FIERY FLARES

Two nearly identical incidents hat occurred at the same base just few hours apart point up the ecessity for extreme care in handling explosives.

During loading of the Nr six gun n an AC-119, the linked ammo eeding into the gun drum caught ie lanyard of a Mk 6 smoke flare. he flare ignited. It was immediely removed from the aircraft but OD people were unable to extinguish it. It finally burned itself out. A few hours later the incident was repeated. Corrective action was to leave the flares in metal shipping cannisters, stored in a box on the rear clamshell doors, ready for use.

Everyone involved in flare handling and employment should frequently review procedures and flare hand launching operations. Here are a few suggestions for supervisors and unit explosives safety officers:

• Make sure operating instructions are available and include sufficient detail.

• Insure that everyone working with flares knows the information contained in TO 11A10-1-107.

• Be sure procedures are established and available for inspection of flares prior to loading. Pay special attention to inspection, launch and emergency procedures. ★



"UNDERSTANDING AND USING GROUND EFFECT"

I read with interest the arcticle, "Understanding and Using Ground Effect," in the May issue of Aerospace Safety, particularly the statement that "the aerodynamic phenomenon of ground effect is generally misunderstood." Perhaps more than the author realized.

As a student test pilot at Edwards AFB, my special project was the investigation of ground effect on the Maximum Lift Coefficient, directly related to stall speed, of the T-33. A series of stalls were run, both in and out of ground effect. When the data was reduced, including gross weight changes due to fuel consumption, my pre-conceived notions that the stall speed in ground effect would be lower were shattered. In ground effect, stall speeds were higher and Maximum Lift Coefficient consequently computed as lower than out of ground effect.

My astute instructors allowed as how that one reason for the "phenomenon" could be that the increased down load on the stabilizer, resulting from the well known and accepted increased nose down pitching moment, effectively increased the gross weight of the aircraft, increasing the stall speed.

My point is not to argue "why." Many discussions have shown that the majority of pilots believe that there is an increase in lift in ground effect. I understand and accept the explanation of the reduction in induced drag in ground effect. I now believe that it does not automatically follow that there is an increase in lift.

Based on my special project and the lack of any other factual, contrary flight test data, I strongly suspect that the "old, increased-lift-in-ground-effect-trick" may be eligible to be enshrined in Aviations Hall of Perpetual Myths. . .

Lt Col R. J. Vanden-Heuvel
Kirtland AFB, New Mexico

Does anyone have any "actual, contrary flight test data?" We'd like to hear from you, if you do.—ED.

"HABIT PATTERN TRANSFERENCE"

I have just read Lt Col Hansen's article on Habit Pattern Transference in the May copy of *Aerospace Safety*. With this article I feel you have made a very important contribution to the safety field.

The article was of particular interest to me because I recently was a victim of this phenomenon. During my first solo flight in a T-41 at Vance AFB, I found myself getting quite apprehensive about landing the "bug-smasher." This, in turn, led to several go-arounds and I suddenly found myself flying in the pattern with my feet and hands in a posture similar to that which I often take driving my manual shift car. My left foot was poised over the "clutch" pedal and my right over the "brake!" The similarity between the aileron controls and a steering wheel didn't help the situation at all, either! Just as you mentioned in your article distraction, fatigue and anxiety all played an important part in this situation. I feel that your advice of "use the checklist" and "know the procedure" couldn't be stressed enough to all personnel whether flying or serving in any other capacity. . . .

I imagine many people could contribute ideas similar to Lt Col Hansen's but hesitate for lack of eloquence—perhaps you should have a Reader's Forum where people could toss out Safety ideas just by writing a short note. Any form of participation should be encouraged.

2d Lt Robert G. Gammill
McGuire AFB, New Jersey

Reference your last paragraph, that's one of the functions of this page. Let's hear from anyone who has ideas on how to prevent accidents.—ED.

☆ U.S. GOVERNMENT PRINTING OFFICE 1970 391-401/12

UNITED STATES AIR FORCE

WELL DONE AWARD



First Lieutenant

Hans-Ulrich Lorenzen-Schmidt, GAF

418th Tactical Fighter Training Squadron, Luke AFB, AZ

On 6 January 1970 First Lieutenant Hans-Ulrich Lorenzen-Schmidt, a member of the German Air Force training at Luke Air Force Base, was on a gunnery mission when his F-104G's engine flamed out on the climb to downwind. He immediately hit the start switches but with negative results. Realizing that he had to maintain relight airspeed, Lt Lorenzen-Schmidt put his aircraft in a descent and unsuccessfully attempted another start. As he approached decision altitude and airspeed for bailout, he attempted a third quick airstart by stopcocking the throttle and immediately returning it to military power. The engine responded. Lt Lorenzen-Schmidt then notified his flight leader and turned toward his alternate landing field. He set up a precautionary landing pattern, using takeoff flaps, and made a perfect landing even though he was overgrossed and had ordnance remaining.

Although he had only 100 hours in the F-104 and 350 hours total time, Lt Lorenzen-Schmidt skillfully responded to an extreme emergency, thus averting a potential accident. WELL DONE! ★



AS THE TEMPERATURE GOES **UP**

THRUST GOES **DOWN**



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Aerospace SAFETY

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SEPTEMBER 1970 AFRP 127-2 VOLUME 26 NUMBER 9



ANT COLONY

Remember when you were a kid and how you used to squat down beside an ant hill to watch the activity taking place? The residents were extremely busy, hurrying to and fro on various errands. Perhaps you were struck by the apparent order even though there was no evidence of direction or leadership.

The other day a couple of us saw something that reminded us of a busy ant colony but instead of ants we were seeing radar returns from airplanes scurrying across traffic controllers' scopes. During a visit to the Los Angeles Air Route Traffic Control Center we were shown a time lapse movie of radar scopes covering the Center's area with the several sectors arranged in a mosaic in order to portray the whole. With time lapse photography (the technique used to show a flower blooming within seconds on your TV screen) several hours were condensed into a movie of about 30 minutes. The thing is frightening.

Specks of light travel across the screen in every direction. Most of them move at approximately the same pace but one went zipping across the screen at a much higher speed. An SR-71, we were told. During the movie there were brief minutes in which the number of specks increased significantly. These were the rush hours for arrivals and/or departures from LAX. We were struck also by the channeling effect of the restricted areas that caused, during the busiest times, the specks of light to almost merge into what looked like a river pouring through a gorge. Each of the specks in this stream was an airplane forced into the funnel between two restricted areas.

Believe we came away impressed.

What perhaps is more sobering is that what we saw on the screen was only the returns from transponder equipped aircraft—no raw radar returns from all the others in the sky.

We wish that every Air Force pilot could see that movie made by L.A. Center. There's a message there and we should read it loud and clear.

Every now and then we hear an individual scoff at the idea that air traffic is great enough to really constitute a hazard. He sees relatively few other aircraft as he transits the country so, apparently, he believes that if he doesn't see them they are not there. Perhaps we are lulled by the protection provided in controlled airspace. Everything there is controlled. But what goes up must come down. So sometime during any flight all aircraft must pass through uncontrolled airspace.

Air traffic control provides positive protection only in controlled airspace. Below that floor you are entering a hostile world. True, the controller can see you, if your transponder is working, but he won't necessarily see everybody else that may try to share the same block of air with you. That is your responsibility and that of the other pilot who may find himself on a collision course with you.

Most Air Force flights are IFR and we take pride in precision flying. Fine, but which is more important, having the needles all lined up on a VFR day or making sure that you are not about to collide with someone else? The old head-in-the-cockpit syndrome can be fatal.

Remember this, because you are betting your life on it: ATC provides positive separation only between IFR aircraft properly equipped for radar interrogation. Radar advisories to VFR aircraft are provided on a "can do" basis only and the controller can't always do it. Also, even though they do a sterling job of it, ATC can't guarantee to vector you around all thunderstorms. Their primary job is to protect you from other traffic and they'll throw in the weather also on a "can do" basis.

If you still have any doubts, read up on the midair collisions. If the occupants of those aircraft survived, you can bet they are believers. ★



TICK

TICK

a few seconds

TICK

TICK

TICK

TICK

TICK

SEAT YOURSELF comfortably in a chair and place your watch where you can see the second hand. When the hand reaches a cardinal number, bend over and untie and tie your shoe. Recheck the second hand. Unless you are a real speed demon, the time ought to be six to eight seconds.

This is not a shoe tying contest. The idea is to get you oriented on time and what a few seconds mean. We'll get back to this a little later.

Joe was a better-than-average fighter jock. In fact, he'd been rated outstanding on his last proficiency check and had about 2500 hours in the F-100C. The mission was a piece of cake—about two hours in almost a straight line to his destination. Weather was generally fair enroute with relatively good weather forecast for landing.

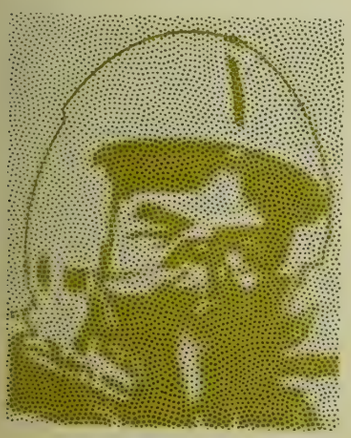
The flight went routinely for about two-thirds of the way, then in level cruise at 35,000 smoke began to fill the cockpit. Joe switched to 100 per cent oxygen, dumped the cabin pressure, and declared an emergency with the Center, requesting an immediate descent. He was cleared down. A few minutes later, he again called the Center and said he was at 26,000, would like to remain there and that everything was back to normal. He got another okay and continued the flight.

Twenty minutes later he was talking to the tower and preparing to land. After issuing landing instruc-

tions the controller asked Joe if he was having any difficulties and got a negative reply. Apparently at that point Joe had no problems. Three minutes later he was dead.

TO OBSERVERS on the ground the approach seemed to be normal, the aircraft pitched left and Joe was cleared to land. On downwind he lowered the gear and it appears that his problems began at that point. Whether it was the engine that failed or the fuel control could not be positively determined. Investigators established that the engine was not putting out sufficient power to maintain level flight. Normally with the gear and speed brakes down the pilot will advance the throttle to compensate for the increased drag. Witnesses said they did not see the usual puff of smoke that would indicate that power had been increased.

When they dug into the wreckage, investigators found the fuel regulator in "emergency" and the airstart switch on, indicating that Joe had tried to get enough power to get him to the runway. It appeared that he cut the downwind leg short and



made a tight, 60 degree bank, turn and lowered the nose. He held this attitude until the aircraft hit the ground a mile off the end of the runway. There was no attempt to eject.

No one will ever know why Joe rode the airplane into the ground. There was no evidence that he was in any way incapacitated, even though he'd had several minutes of unpressurized flight when he'd had to dump cabin pressure. The possibility that the loss of pressurization affected him was not discounted. but the investigating board could not pin down any hard evidence of this and listed it only as a possible contributing factor.

It was agreed that the cause was material failure, probably of the fuel system or the fuel control system. A drift punch was found in the wreckage, indicating that some maintenance man was careless at some time or other, but it could not be proven to have had anything to do with the accident.

As we said, Joe was a very competent pilot with lots of experience in the airplane he was flying. So we don't want to try to second guess him. But a bit of hypothesizing might help some young jock who reads this the first time he gets in a tight, such as the one that got Joe.

With the gear and speed brakes down and an engine that wasn't putting out, Joe was in a real box. He didn't have much time to do anything, but he did have enough time to eject if he acted quickly. By the time he'd switched the fuel to emergency, got the airstart switch on and rolled into the turn, time had just about run out on him. At best, he had but a few seconds to take any action and Joe opted to try to get the engine going.

NOW BACK TO THE shoe-tying bit we started out with. How long it takes one to tie a shoe is not important, but if you tried it you realize that, while it seems but a moment, about seven seconds elapse. The point is that in the time it takes one to tie his shoe an emergency can deteriorate into a catastrophe.

Surely when the emergency occurred, Joe had time to eject and probably enough speed to give himself an up vector. If he had kept going straight ahead he may have had time for an airstart attempt or two and, that failing, still have had time to get out. With the gear and speed brakes down, the steep turn cut his margin even more, even though he had the nose down.

Whether Joe gave any thought to ejecting we don't know. But his fate was the same as that of a dozen others last year who aren't around any more because their decision to eject came too late. How about bending over and tying your shoe? It'll give you some idea of how fast time moves. ★

As the heat of summer wanes, now is the time for some cool thought on preparations for winter



SUMMER HAS JUST ABOUT had it and most of us are looking forward to the pleasures of autumn. If autumn is upon us can winter be far behind? Skiers and other winter sports fans can hardly wait; already the sporting goods stores are featuring skis, parkas, sleds and ice skates. Taking a cue from this, lets turn our attention to the airpatch.

Preparations for cold weather operation begin in the early fall, well before the first snowfall. The cold weather operation plan should be reviewed in light of unresolved problems that existed last year and should include a review of all applicable directives.

Each year accidents occur because aircraft touch down in snow banks, land short, or lose directional control on snow or ice covered runways. This type of accident can be greatly reduced by adequate snow removal and winter weather preparation. Optical illusions resulting from snow drifting over threshold lights or approach lights have been major contributors to mishaps. Runway definition becomes difficult, if not impossible, when the entire countryside is covered with a blanket of snow. Variations in runway condition where snow or ice cover portions of the runway, and melted snow does not drain from the runway, can result in skidding, slipping and hydroplaning.

Since many accidents occur during landing, let us look at the lighting aids. Even during daylight, the lack of contrast of a snow covered runway presents a problem similar to night operations. The runway lights, threshold lights, approach lights, strobes, VASI and runway distance markers are devices used to orient the pilot with the runway and to insure adequate visual reference during approach, landing, and rollout.

WHEN SNOW IS ON THE GROUND, each of the aids listed above contributes more to preventing accidents than at any other time. The runway lighting system may be the only reference to the runway environment during conditions where snow is blowing across the runway. It is imperative that there be no compromise in insuring the availability and optimum performance of these systems.

Prior to the first snowfall each runway light globe and lens should be inspected. Dirty or cracked lenses reduce the intensity of the light emitted from a fixture and degrade the effectiveness of that visual aid. Replace all defective lenses and clean or replace all dirty lenses. Wash and clean all semiflush or flush mounted fixtures as necessary. Clean the lenses and filters of the VASI system as required, and check the intensity of the approach lighting and strobes.

Give priority to maintenance and inspection of snow removal equipment. The operators of this equipment must be checked out prior to the first snowfall. Flight line operation procedures must be detailed and complete. Equipment operators must be intimately familiar with coordination procedures between

Lt Col David L. Elliott, Directorate of Aerospace Safety

THINK COLD



themselves, base operations and the control tower.

A runway covered with snow, ice, slush, or water presents problems of directional control and predicting stopping distances. Obtaining a valid RCR in patchy runway conditions where snow, ice, slush and water exist can be difficult. The lack of an accurate RCR precludes the prediction of a realistic stopping distance. The RCR system has proven to be adequate on snow and ice; however, it is grossly inadequate for wet or slush covered runways. Don't fall into the trap of ignoring that portion of the runway where the snow has melted, particularly if the runway is still wet.

WHEN SNOW IS BANKED on each side of the runway, drainage can be a serious problem — standing water can result in hydroplaning and a stopping distance greater than for an ice covered runway. As an example: During the Combat Traction Test in January 1970, an ice covered runway was tested as having a 3.4 to 1 stopping distance ratio (icy to dry). A portion of a runway in Texas was checked in June of 1970 (under both wet and dry conditions) and had a stopping distance ratio of 3.57 to 1 (wet to dry). The problem arises in that RCR will not predict this slickness on the wet portion of the runway. (Your attention is invited to the Combat Traction article on page 10 of the June 70 issue of Aerospace Safety.) Use of thawing agents, such as propanol, should be accompanied with provisions for drainage. Frequent RCRs should be obtained. Patchy conditions should be reported to the pilot particularly if the runway is wet or flooded.

A new Air Force Regulation 55-42, Aircraft Arresting Systems Management and Use, is forthcoming. This regulation will outline cold weather procedures for aircraft arresting systems. The regulation will state that during snow and ice removal, barrier nets and hook cables



Runway lighting system may be the only reference when snow is blowing across the runway.



Adequate preparation, as above, pays off when conditions such as shown below arrive.





"I told you last summer to stop overparking."

THINK COLD

CONTINUED

may be removed from the runway but the arresting system will be returned to operational status as quickly as possible. Enough of the overrun should be cleared to allow an obstacle-free runout of the arresting system plus the length of the arrested aircraft.

When cold weather makes the remote function of the MA-1A net unreliable, the arresting net will be raised manually and left in a cocked position on the departure end of the runway. Arresting systems with below ground installations should not be a significant maintenance problem. However, a surface mounted system will have to be covered in some way so that the retraction motors can be easily started for rewind and cable tensioning purposes. Snow and ice must not be permitted to accumulate in the deck sheaves. And above all, the rewind motor exhaust system must be kept cleared of snow.

Removing snow and ice from the runway and associated facilities and proper maintenance of these systems during hours of snowfall require a continuous effort. Of course, ramps and taxiways and base roads also have to be maintained and cleared of snow. This just adds to the work, but it can't be allowed to detract from the necessary priority of the runway and its facilities. That's where you prevent aircraft accidents. ★



alert

Useful tips from UEIs

Observations noted during Unit Effectiveness Inspections

BAK-9 barrier pit was extremely untidy. Dirty rags were in one corner, there was a hydraulic leak, and drive chains needed cleaning and relubrication.

Wing safety office aircraft accident investigation kit and fire department emergency vehicles contained **obsolete and non-definitive grid maps** which could delay response to an aircraft accident.

Among **deficiencies in tech data compliance** noted at one base were the following: F-4 aircraft parked without canopy safety struts; an igniter being removed from an M32A-60 without use of the TO; specialists working on avionics equipment not using TOs; specialist working on pressure test set without tech data; ditto for tech working on LOX system.

Unsatisfactory inspection and maintenance of life support equipment: periodic inspection of helmets, masks and parachutes not performed, inspection forms not maintained, parachutes overdue inspection not tagged, TO file not correct and TO compliance records not maintained.

Seven mechanics working on an aircraft were **not wearing ear defenders,** although the aircraft jet power unit was running and an engine power check was being run on the aircraft in the next parking spot. Much noise. **Not one of the seven men had ear plugs or muffs in his possession and only one had even been issued ear plugs.**

Fuel system maintenance procedures being performed on an aircraft in a hangar were not in accordance with TO 1-1-3. Two technicians were in the fuel tank **without a safety observer present to observe and act in an emergency.** Flashlights issued to two crews were not explosion proof. Al personnel were not wearing white coveralls, caps and boots. Cigarettes, lighters, wrist watches, etc., were lying on a ra near a crew working on a fuel tank. ★



Toots

is interested in your problems. She spends her time researching questions about Tech Orders and directives. Write her c/o Editor (IGDSEA), Dep IG for Insp & Safety, Norton AFB CA 92409

Dear Toots

Please help an old troop clarify to some of our younger airmen a few whys in reference to TO 00-20-5. I believe I know, but it would be nice to read it from an authority such as you.

First of all, TO 00-20A-1 (replaced with TO 00-20-5) required a maintenance officer's signature every 30 days in block "g" of AFTO Form 781B. At first, TO 00-20-5 also contained the requirement, but it has been changed and the reference dropped. However, some commands continue to request it.

Second, block 7 of the AFTO Form 781H requires only one signature for preflight. The way we read TO 00-20-5, page 2-6 para 2-58 sub para (d), all other entries will be printed. I believe I know why but can you explain? We do agree that the preflight signature is needed since it is not entered on the 781A.

MSgt Patrick A. Bowers
Randolph AFB Texas

Dear Pat

The requirement for the maintenance officer to sign the 781B, or current 781J, was dropped from TO 00-20-5 by popular demand of the commands. The primary reason was to free the maintenance officer for more pressing duties.

Now, signatures versus printed names in block 7 of the 781H: The first sentence of paragraph 2-58d of 00-20-5 answers your question. Quote: "This column will be used to record the signature OR printed name of the individual who accomplishes the inspection or maintenance identified by the line entry." In other words, since the inspector is not required to sign his name in block 7 of the 781H when he clears a red cross in the 781A, the crew chief will have to print the inspector's name in block 7 of 781H.

Toots

THE WINDSHIELD WAS FULL OF HILLSIDE — LEAVES AND BRANCHES RIGHT IN FRONT OF THE PROP!

i guess i pressed

During mission planning, the Intell briefer singled out one target for special attention. It was hidden in the trees and photography didn't really show anything but the foliage patterns. But, he said, it was there, all right. If we got it, we'd know. Above-ground ammo storage. It should blow sky-high!

I remember thinking that it's a lot better to get it while it's still in the boxes and crates.

I'd been given two flights of fighters to put on it. With two flights of four I was sure to get it. I was visualizing the fireball and secondary explosions while I flew to the target area.

When I got there, I was glad I had a few minutes before the first fighters would arrive. There had been no difficulty finding the ravine where the target was located; the area looked just like the photos. That was the trouble, it looked *just like* the photos. All trees. Thick foliage. No way of seeing through it to tell what was underneath.

I got down lower than I liked and still couldn't see below the jungle canopy. The Intell guy had said to be prepared for moderate automatic weapons fire. I kept the airplane moving, jinking. But all I could see was treetops.

I climbed back up to a more comfortable position and picked out some landmarks to use in directing the fighters. When the first flight of F-4s checked in, I was waiting for them. I gave them a heading to fly after a couple of hold-downs and ADF cuts. While they were inbound, I described the ravine and the target. By the time we spotted each other, we were ready to go to work. Dropping pairs, they could each make several passes. I didn't see any ground fire so we kept at it, kind of pattern bombing. I started working the east side of the ravine from north to south. As each pair of bombs went off, I expected to see the secondaries I had visualized. But they didn't happen.

Then the F-4 leader called "last pass," and they were gone. I was disappointed. But then the second flight was checking in. I gave them my preliminary spiel of target and terrain information and a heading to fly. They estimated about five minutes out, so I decided to take another close look. Assuming the area covered by the first flight didn't

contain the storage area, I had a much smaller area to search.

Right down on the trees this time, I spotted something on the second pass. Couldn't be sure. I pulled up and bent it around and back over the very small clearing in the trees. But on this heading I couldn't see a thing down there. The fighters reported over me and had me in sight. I told them to turn left for a while—I'd be right with them. Then I made another pass up the east slope of the ravine where I'd spotted something below the trees. That was it! There it was! Covered with something black, tarpaulins perhaps. But that was it. If I approached from the west, from the bottom of the ravine, I could see it!

Climbing up to mark, I described in detail the spot I wanted the fighters to hit. Lead said he was pretty sure he knew where I meant, and I rolled in to mark.

It was beautiful. On this heading, the dark forms were obvious below the trees. I watched the marking rocket for a second before I started my pullup. It was headed straight and true. I was ready to call "Hit my smoke."

But when I'd pulled the bird around to where I could see the target over my shoulder, there was no smoke!

Lead called, "No smoke." I knew he was waiting to roll in.

"Okay, I'll mark again real quick." I ruddered the little bird around. "In to mark."

The familiar trees came into my windshield. But I was too far south, slanting up the hill instead of directly toward it. For several moments I couldn't find the black shapes under the trees. Then I saw them.

Nothing happened when I punched the rocket button on the stick. I glanced instinctively at the wing. The rocket was still there. I jabbed viciously at the button again. This time a rocket went. But I didn't have time to watch it. The windshield was full of trees and hillside.

I pulled.

The airplane rotated and started up the hill. But the hill was going up, too.

My God! I'm not going to clear it! The leaves and branches are right in front of the prop!

And then I was through them. There had been a jolt, almost as if the airplane stopped for a moment. But it was still flying. Yawing, rolling to the right. Left rudder—

Lots of left rudder and left aileron brought it back under control. Headed up again. The trees fell away beneath me. Climb—

Keep climbing. The engine sounds okay. Gages look good.

"I've got your smoke—Lead's in on your smoke." It sounded far away.

I wasn't concerned with anything but learning if the airplane would fly me home. As I climbed, gingerly feeling out the bird, my confidence returned. The machine was going to hold together. I'd take it up high enough to check it in landing configuration.

Lead called off and Two called in. Then another voice called excitedly, "Hey, the FAC's in trouble —you all right?—you been hit?"

My mouth was dry. I swallowed hard and tried to sound calm.

"Okay now—brushed the trees—overeager—I guess I pressed." ★

HOLES IN THE LIFESAVERS

Robert H. Shannon
Life Support Systems Specialist
Directorate of Aerospace Safety

Despite improvements to ejection systems to enlarge the escape envelope, the USAF ejection success rate decreased sharply last year. Analysis of all ejections indicates a need for further hardware improvements, better maintenance and greater emphasis on aircrew ejection training.

During the four years from 1966 through 1969, the USAF fatality rate in ejections climbed steadily from an all-time low of 12 percent to 21 percent in 1969, the highest in 11 years.

Since this increase occurred despite many modifications in recent years to improve the escape envelope of USAF egress systems, there must be more than one hole in this lifesaver. What are they?

In an attempt to answer this question the Life Sciences Group of the Directorate of Aerospace Safety analyzed all ejections during 1968 and 1969 except those that occurred in Southeast Asia due to enemy action. Also an Egress System Task Group was formed to critically analyze all Air Force escape systems, identify deficiencies and establish programs for corrections.

There were 355 ejections studied of which 66, 19 percent, terminated in fatalities. Of primary interest to us were (1) the phase of ejection in which the injury was incurred, and (2) the specific mechanism of injury. For the purpose of this analysis, the unsuccessful ejections were categorized as "ejection out of the low-level capability of the systems involved" and "other." (Figures 1 and 2.)

The ejections out of the low-level envelope were essentially a function of time; that is, time available for completion of the ejection sequence was less than the time required, due to insufficient terrain clearance, adverse attitude, high sink rate, and sometimes low airspeed. This category accounted for 65 percent of the total fatalities. Although ejections out of the low-level envelope are, by definition, due to deficient low-level capability of existing systems, the single most significant area of concern is the decision factor. *Far too many crewmen delay the decision to eject until such time as the conditions of ejection offer little or no hope for successful recovery.*

In 1969 alone 13 of the 24 reported ejections were initiated out of the low-level envelope when the crewmember delayed the decision to eject. All of these 13 would probably have been successful had an earlier decision to eject been made. Three crewmembers involved had no control of the situation; i.e., one is believed to have delayed in order to avoid a populated area, and the other two may have been injured or incapacitated momentarily as a result of a mid-air collision. Thus, of 24 fatalities attributed to ejection out of the low-level capabilities of

the systems involved, 42 percent were definitely preventable. Continued emphasis must be placed on the decision factor in aircrew egress training.

Since the decision to eject rests solely with the crewman, he must have a thorough knowledge of the capabilities of his escape system under all conditions. Training Film Nr SFP 1856, "Ejection Vectors," is an excellent tool for getting this point across and should be an integral part of egress training.

THE "OTHER" CATEGORY includes those misadventures that cause a within-the-envelope ejection to terminate in a fatality. While this is perhaps the most frustrating area, it is the most fruitful in terms of preventable deaths. The 23 fatalities in this category, which accounted for 35 percent of the total, included some very unusual circumstances and injury patterns in addition to those observed in previous analyses.

Three deaths were attributed to seat/man/parachute interference, two of which involved lethal blows to the head by the seat after separation. In one of these, the crewman was struck by the unoccupied seat of the rear crewmember of a tandem aircraft; the other occurred as a result of a system malfunction. The third case involved entanglement of the seat with the parachute, preventing complete inflation of the chute. The crewman was killed on impact with the ground. Efforts to eliminate this hazard are being expedited. Two aircraft, the F-84 and the F-105, incorporate an 8-foot-diameter chute, which is mounted to the underside of the ejection seat and retards the seat after separation. This has been quite effective in eliminating the incidence of seat/man/chute interference in these aircraft. A more positive means of seat-man separation is programmed for incorporation in the F-100, F-102, F-104 and the T-38/F-5. For those aircraft for which no current programs are in being, recommendations have been presented by the Air Force Egress Systems Task Group.

In addition to the above-cited seat-man recontact fatality which was due to system failure, five other fatalities were directly attributable to failure of an egress system component. Two resulted from delayed ignition of the rocket catapult wherein the resultant damage to the seat shell prevented normal separation and the crewmembers impacted in their seats. Subsequently the cause of the delayed ignition of the rocket catapult was discovered. A crash program was immediately started to rework all of the involved catapults to eliminate delayed ignition of the rocket motor. The fix added a booster igniter in the rocket motor to guarantee scheduled ignition.

FIGURE 1

USAF EJECTION EXPERIENCE

1 Jan 1966 - 31 Dec 1969

Year	Total Ejections	Fatal No.	Fatal %
1966	170	20	12
1967	207	29	14
1968	183	30	16
1969	172	36	21
Total	732	115	16



Failure of the ballistic catapult was a factor in another fatality. This was an extremely rare condition in which abnormal stress forces at time of ejection caused structural failure of the seat, thereby reducing the trajectory height of the seat-man mass. The pilot and seat contacted some portion of the aircraft external structure simultaneously with the seat-man separation, which resulted in fatal injuries.

One fatality was due to failure of the force-deployed personnel parachute. Because of a defective primer, the cartridge which fires the drogue slug did not fire. This was a very low-level ejection and the pilot did not have time to manually deploy his personnel chute. It was determined that the primer was subjected to high temperatures which caused it to become defective. The force-deployed parachute has been temporarily removed from service pending satisfactory solution of the problem. It is anticipated that it will be reinstalled incorporating a template on the deployment gun which will indicate whether or not the gun has been subjected to high temperatures.

Consideration is being given to a redundant system, i.e., incorporation of an automatic actuation feature of the parachute, such as the gold key, in the event of a possible

HOLES IN THE LIFESAVERS
CONTINUED

failure of the deployment gun. These are interim measures, however, and the ultimate solution lies in the development of a primer which will not be adversely affected by high temperatures. A project is currently under way for the development of such a primer.

The final case involved a failure of the lap belt release. This, too, was a low-level ejection with insufficient time to go manual. It was concluded that, due to the conditions of ejection, unusual loads were applied to the belt latching mechanism, causing it to bind. A new lap belt designed to eliminate this problem has been developed, and is now being incorporated on all ejection-seat-equipped aircraft. This new lap belt will also get rid of the long-standing problem of inadvertent opening of the manual lap belt release lever which negates automatic function of the parachute.

Ejection at extremely high speed resulted in three fatalities. In two from the same type aircraft, it was estimated that ejection occurred at about mach 1.1-1.3 (about 670 KIAS) with the aircraft in a 60-70 degree nose down attitude and from an altitude of approximately 10,000 feet above ground level (AGL). One crewmember hit the ground still in the seat and the other separated but did not obtain an operable chute. The lethal threshold of ram air pressure is about 600 knots at sea level. It is quite likely that both crewmembers received fatal injuries from ram air pressure on entry into the airstream. The third case was a classic example of extreme high-speed and chute-opening-shock injuries incurred in an ejection estimated to have occurred at 600 KIAS, from an altitude of 5000 feet, while the aircraft was in a 70-degree dive.

Four crewmembers failed to survive parachute water landings following successful over-water ejection. Two are missing and two were recovered drowned. Both of those recovered sustained nonfatal injuries during some phase of the ejection sequence, which undoubtedly contributed to their inability to survive.

Two pilots died in low-level ejections when they descended into the area of the wreckage fireball. In one of these the chute was severely burned, rendering it inoperable, and the pilot free-fell to his death. In the other, the pilot received fatal burns to 80 percent of his body after parachute landing.

The remaining six fatalities included three due to causes observed with some degree of frequency in past analyses and three due to very unusual conditions. Of the former, one involved inadvertent release of the manual lap belt release lever, which negated automatic function of the chute; one held onto seat actuating controls after automatic operation of the lap belt and impacted in the seat; and one failed to attach the chute arming lanyard to the lap belt.

The three involving unusual conditions were as follows: One pilot ejected without having his chute risers attached to his integrated harness. He was killed on impact following a free fall from about 4000 feet. Another death was attributed to poor ejection posture and very loose restraints. This crewman de-

FIGURE 2

EJECTION FATALITY CAUSES

1968 - 1969

	1968	1969
Ejected Out of Low-Level Envelope	19	24
Other	11	12
Seat/man/chute interference	—	3
System failure	3	2
High "Q"/Chute-opening shock	3	—
Drowned/missing	2	2
Descended into wreckage fireball	1	1
Held onto seat	—	1
Inadvertent opening of lap belt	—	1
Chute risers not attached to harness	—	1
Chute arming lanyard not attached	—	1
Poor position/loose restraints	1	—
Struck canopy bow	1	—
Total	30	36

FIGURE 3

PROPORTION OF FATAL INJURY CAUSES TO TOTAL EJECTIONS

1 Jan 1966 - 31 Dec 1969

	Total Ejections	Out of Envelope		Other	
		No.	%	No.	%
1966	170	11	6	9	5
1967	207	16	8	13	6
1968	183	19	10	11	6
1969	172	24	14	12	7
TOTAL	732	70	10	45	6

scended under a fully developed parachute but died as a result of multiple injuries received during the ejection. In the remaining case, the aircraft was involved in a mid-air collision with another aircraft. The aircraft canopy bow was pushed down and inward during the collision, and when the pilot ejected, his knees and lower torso contacted the deformed canopy bow, inflicting severe injuries to his knees and pelvis, which proved fatal.

In four of these six cases a lack of adequate training is again reflected. Fatalities due to failure to use available equipment, improper position for ejection (particularly when it is a controlled situation), and holding onto seat actuating controls need not ever occur. Training programs must emphasize these conditions to insure that they will not occur in the future.

This analysis did not provide all the answers to the marked increase in the ejection fatality rate; however, it did disclose some very pertinent findings. The proportion of ejections out of the low-level envelope resulting in fatalities showed a definite upward trend. The rate was six percent for 1966, eight percent in 1967, 10 percent in 1968, and 14 percent in 1969.

BASED ON PREVIOUS analyses of ejection escape experience, ejection out of the low-level envelope usually results in about five to ten percent of the total. Obviously more crewmembers are attempting ejection under marginal or impossible conditions. It is also obvious that many of these involved excessive delays in the decision-making process. The reasons for these delays will probably never be known; however, evidence indicates that in some cases the crewmember's decision may have been influenced by the fact that his escape system had recently been modified to improve the escape envelope. Such improvements are made solely for the purpose of giving the crewmember a better chance of survival in marginal situations. They should *never, repeat never,* be used as the basis for delaying the decision to eject. No improvements in ejection systems can prevent fatalities if the aircrew fails to make the necessary decision to use the system within its capabilities.

The proportion of within-the-envelope ejection fatalities was essentially the same for the four-year period 1966-1969 as shown in Fig. 3. Perhaps the most pertinent finding here is the change in the mechanism of injury within the category. For example, there was a sharp decline in the number of drowning deaths, whereas the number attributed to system component failure was unusually high. It is apparent that our egress system improvement programs are not being achieved without additional system complexity. As escape systems become more complex and sophisticated, the maintenance requirements are definitely going to be more demanding. The assignment of egress maintenance personnel to specific systems on a permanent basis may be the answer to this problem. Whatever the ultimate decision is in this regard, experience definitely documents the requirement for increased emphasis on egress system maintenance procedures. Egress system improvement programs are receiving a great deal of high-level attention. The objective is as near 100 percent recovery as possible of all of our aircrews when inflight egress becomes necessary.

Egress system training, egress system maintenance practices and procedures, and quality assurance are receiving high priority attention in the current program of Unit Effectiveness Inspections (UEIs) which are being conducted by the Deputy Inspector General for Inspection and Safety. In the final analysis, the elimination of preventable deaths that result from inflight escape from Air Force aircraft primarily rests with the individual crewmember. He must have the best equipment available and the best training possible. ★

REX RILEY'S CROSS COUNTRY NOTES



SEVERAL YEARS AGO, the pilot of a T-33 was in a dire hurry to get home. His only hangup was an electrical problem that Transient Maintenance had been gnawing on from 0700 until about 1500. The problem finally resolved, the jock climbs into his Lockheed Racer for the one hour trip home. All goes well until the inverters come on—no attitude indicator. Since the weather at home is not too keen, he elects to shut down and switch instruments with the back seat (he's alone anyway). Another start and clearance but the instrument still doesn't work.

Now our boy is really tight jawed. He's been pacing the ramp for almost 12 hours in an attempt to get home. The only thing that stands in his way is an unreliable attitude indicator. He feels his only recourse is to go anyway—he has to get back!

The last transmission by the pilot, heard by Approach Control at home plate, was "I think I'm going to crash." He was dead right. The T-bird was scattered over a quarter of a mile of mountainside. The pilot lost it while attempting a let down through turbulent air, at night, in weather.

What's the moral? There are several buried in this true story. A lot of guys are not around today because of *gethomeitis*. Don't lose your cool. Pilots frequently get impatient with the transient maintenance troops and start blaming them for their troubles. Of course, it may be that they have never seen your type aircraft before. But that doesn't protect them from an irrational, irate jock bent on getting home. All the nasty words accomplish is short tempers and bad torques. Lay off; more often than not, the job will get done quicker and better.

Fatigue and anxiety don't mix with flying airplanes. Aside from the fact that regulations prohibit flying without a full set of gages, partial panel flying is a bit testy even when you've been practicing.

What does all this have to do with Rex? First, I think we all have to agree that everybody is a better pilot when wearing a smile and sporting a full tummy than when giving with a frown and a growl. Transient service throughout the Air Force has a chance to put our traveling



pilots in the proper frame of mind. How much smoother things seem to go when, after a good night's sleep in a quiet VOQ or VAQ, the crew arrives at Ops and finds the 175 (yours) generally filled out, the weather man waiting to brief, a full load of gas and APU plugged in.

Contrast this with "Gee, our forecaster just stepped out," or "We had a problem with our only APU; can you make a battery start?" or "I'm sure we have a west high altitude planning chart somewhere." Ever sit in the cockpit on a hot ramp and hear clearance delivery say "We don't have your flight plan yet?"

What all this tells Rex is that somebody doesn't really care about the image presented to the traveling Air Force. By such actions first impressions are lasting ones and any IG inspector will tell you that if he walks into a shop that's neat, and the NCO has on a clean uniform, chances are the inspection won't go nearly so deep as it would if rubbish is scattered around the floor and the troops working in the shop look as if they just came back from survival school.

In short, super service by TA implies a smooth functioning outfit.

How about improving your transient facility? We know of one base, anxious to get the Rex award, that has a panel composed of all those base agencies responsible for transient services (Approach Control, TA, housing office, tower, POL, etc). They periodically review complaints to correct deficiencies noted on their questionnaires. Efforts like this just can't help but bring good results.

A cheerful smile on the TA chief's face may not improve the situation when he reports an oil leak in your engine but may avoid his getting hit with a loose fire extinguisher. Courtesy doesn't cost anything but if it did the Air Force should buy it by the ton.

Improvement in transient facilities normally occur when the responsible officer or NCO heeds the remarks made by transient crews. An inspection of critical areas may affirm or deny the validity of the crew's statement, but in either case, it has prompted a self-evaluation. The only way our TA is going to get an outstanding rating is by a conscientious effort to give the very best service available.

Aircrews can help by being tolerant, wearing a smile and not expecting miracles. A thanks that the TA guys know is sincere will get a jock a lot more cooperation than a growl. ★



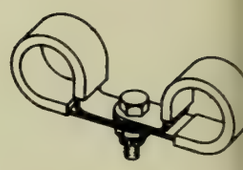
REX RILEY

Transient Services Award

LORING AFB	Limestone, Me.
McCLELLAN AFB	Sacramento, Calif.
MAXWELL AFB	Montgomery, Ala.
HAMILTON AFB	Ignacio, Calif.
SCOTT AFB	Belleville, Ill.
RAMEY AFB	Puerto Rico
McCHORD AFB	Tacoma, Wash.
MYRTLE BEACH AFB	Myrtle Beach, S.C.
EGLIN AFB	Valparaiso, Fla.
FORBES AFB	Topeka, Kans.
MATHER AFB	Sacramento, Calif.
LAJES FIELD	Azores
SHEPPARD AFB	Wichita Falls, Tex.
MARCH AFB	Riverside, Calif.
GRISSOM AFB	Peru, Ind.
PERRIN AFB	Sherman, Tex.
CANNON AFB	Clovis, N.M.
HICKAM AFB	Hawaii
LUKE AFB	Phoenix, Ariz.
RANDOLPH AFB	San Antonio, Tex.
ROBINS AFB	Warner Robins, Ga.
TINKER AFB	Oklahoma City, Okla.
WETHERSFIELD AFB	England
HILL AFB	Ogden, Utah
YOKOTA AB	Japan
SEYMOUR JOHNSON AFB	Goldsboro, N.C.
ENGLAND AFB	Alexandria, La.
MISAWA AB	Japan
KADENA AB	Okinawa
ELMENDORF AFB	Alaska
PETERSON FIELD	Colorado Springs, Colo.
RAMSTEIN AB	Germany
SHAW AFB	Sumter. S.C.
LITTLE ROCK AFB	Jacksonville, Ark.
TORREJON AB	Spain
TYNDALL AFB	Panama City, Fla.
OFFUTT AFB	Omaha, Nebr.
ITAZUKE AB	Japan
ANDREWS AFB	Washington, D.C.
McCONNELL AFB	Wichita, Kans.
NORTON AFB	San Bernardino, Calif.
BARKSDALE AFB	Shreveport, La.
HOMESTEAD AFB	Homestead, Fla.
CHANUTE AFB	Rantoul, Ill.

CLAMP SENSE





Installation of an Adel clamp to secure a wire bundle or a flexible line carrying fluid has always been difficult. Ask any old timer.

After you have asked the old timer, check with a young modern mechanic and you will find the same problems still exist and, if anything, are more acute today because of the more complex equipment and higher temperatures we encounter. Obtaining clamps that will withstand the heat has occasionally been difficult but, with few exceptions, the maintenance man has brought this problem down on himself.

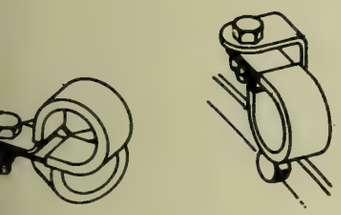
To illustrate why maintenance has at times been the cause of clamp shortage, take the case of a mechanic replacing clamps in the hot section of an engine. The clamp he removed was designed to take the heat, but the replacement was not. This could have happened because the mech didn't specify the right type, or supply issued the wrong clamp, or the maintenance man picked up the wrong clamp from bench stock. Later, when the installation of the wrong clamp is detected, maintenance looks around and finds many more such low temp clamps installed in hot sections. Then their replacement causes a sudden drain on the supply of high temp clamps.

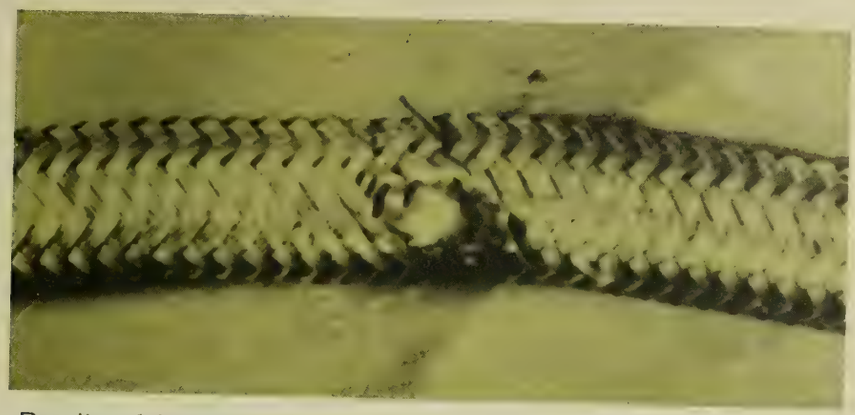
This situation could have been averted had the mechanic checked the part number on the replacement.

There is evidence that some maintenance personnel may not know what we are talking about when reference is made to the part number on the clamp. So what follows is a brief description of what can be found in most all clamp part numbers.

Letters make up some of the part number and these letters indicate what the clamp and the clamp cushion is made of. For instance, take part number MS21919-DG4. The "D" indicates it's made of aluminum alloy, the "G" that it is non-fuel resistant. However, take the same part number and substitute the letters FW. The letter "F" indicates fuel resistant. The letter "W" indicates wedge shaped cushion. No doubt you mechs will say, "I know that." But did you know that this same fuel resistant clamp was intended for use in areas where fuel or fuel vapors are the normal thing and not for general use, because air causes the cushion of the clamp to deteriorate? If you desire more specific information on a particular clamp, consult the military standards for the part number you have in mind.

Obtaining the right clamp is only a small part of the problem. Im-





Results of improper clamping. Refer to TO 42E1-1-1 for limits of hose damage.

properly installed clamps or not enough clamps have caused many problems such as those in the three examples listed below.

Shortly after takeoff, while passing through 10,000 feet, the pilot of an F-101 noticed indicated airspeed decreasing. By the time he had reached 15,000 the gage was reading "O", his true airspeed was normal but altitude and vertical velocity indications were erratic. After he descended to traffic pattern altitude, all indications were back to normal again. Investigation revealed a broken static airline in the cockpit area. The break was caused by an improperly installed Adel clamp which produced excessive rigidity in the line. Vibration caused the line to fail.

Another problem bugging the experts is improper clamping of the flexible hose portion of the afterburner on-off signal line installed on the J79-15/17 engine. Several incidents have been reported where this line has failed, one of which was on an F-4 on takeoff. At 100 knots the left fire warning light came on and stayed on until the aircraft had taxied off the departure end of the runway after the pilot aborted the takeoff. Maintenance found a pin hole in the flexible portion of the on-off A/B signal hose.



Conduit improperly clamped.

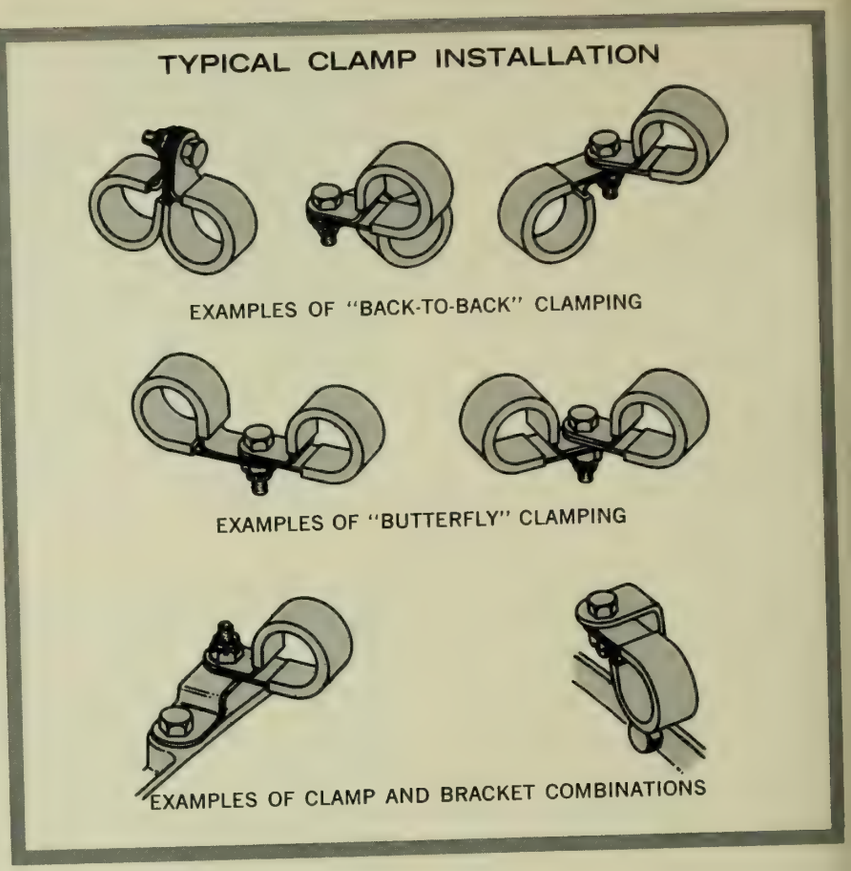
Another F-4 incident occurred immediately after takeoff while the engines were still in A/B. The Nr 2 engine fire warning light came on but went out as soon as the throttle was moved out of A/B. Investigation revealed the oil scavenger hose had chafed a hole in the flexible A/B line. While the engine was in A/B, fuel sprayed from the hole in the flex line and ignited causing minor fire damage.

A review board was convened to investigate the causes of the two F-4 fires cited here as well as a rash

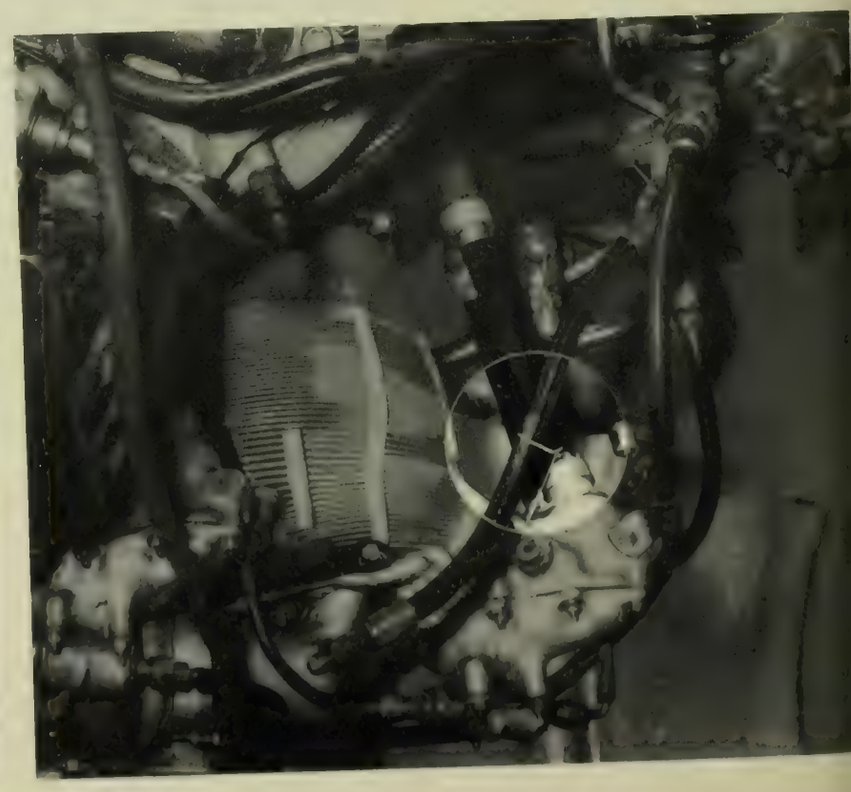
CLAMP SENSE

of similar fires. The board decided on three prime reasons for the fires: (1) Design deficiency; (2) inadequate tech data; and (3) improper installation of clamps that secure the lines and hoses that are failing. Nr 2 in many cases could be the cause of Nr 3 in that the TO did not furnish clear cut guidance on how and where a line should be clamped. Many of the TOs have since been revised and are very clear on these points. As for number one, engineers (aircraft designers) are working on improved designs for routing electrical leads, hydraulic hoses, etc. Future aircraft engine bays will not be used as a routing place for any lines except those essential for engine operation, such as the fuel line.

For the present, however, we must do the best we can with what we have, which means maintenance must be doubly sure that all lines are properly clamped. Improper clamping can put a flight crew in a very dangerous situation. Use the TO that covers the equipment you're working on for proper clamping procedures and don't be the one to box the aircrew in a corner. ★



Drain line secured to push rod with safety wire.



Conduits such as this one must be clamped.

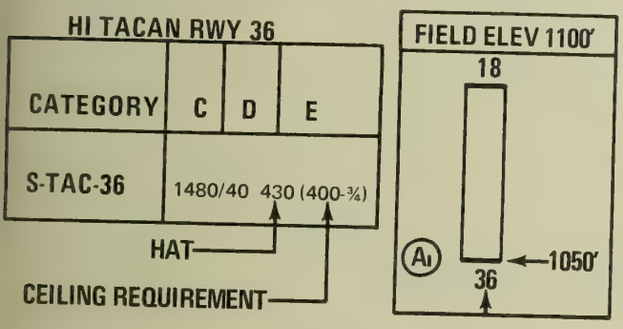


THE I.P.I.S. APPROACH

By the USAF Instrument Pilot Instructor School, (ATC) Randolph AFB, Texas

HAT

Q The March 1970 "IPIS Approach" article pointed out that Height Above Touchdown (HAT) is now used for straight-in approaches and that Height Above Airport (HAA) is used for circling approaches. If I find the following approach which lists the HAT as 430′ and requires a 400′ ceiling, is it legal? If so, how can I expect to break out?



A The HAT and ceiling requirements shown above are correct. The example shows an MDA of 1480′, touchdown zone elevation of 1050′, and a field elevation of 1100′. The HAT is:

1480′ MDA	HAA would be:
−1050′ Touchdown Zone Elevation	1480′ MDA
430′ HAT	−1100′ Field Elevation
	380′ HAA

The ceiling is determined by using the *HAA* rounded to the *next higher* 100′. In this case, the HAA is 380′ and the ceiling would be 400′. Although the HAT is 430′, there should be no problem breaking out because weather is reported above field elevation. A 400′ ceiling would be approximately 1500′ MSL (see March 1970 "Approach" article) and since the MDA is 1480′, you should be below it. The visibility requirement is computed separately and takes into consideration lighting available.

TEARDROP PENETRATION

Q AFM 51-37 states, "Descend from the altitude specified for completion of penetration turn when on the *inbound course.*" The question that comes up on this is, "What do you mean by *on* the inbound course?"

A The IPIS considers within ±5° of the inbound course (and will remain within ±5°) to be *on* the inbound course for the teardrop penetration. A ±5° tolerance will keep you within the airspace where obstacle clearance is provided.

POINT TO PONDER

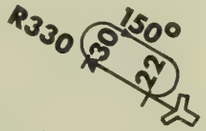
Holding, when necessary, will usually occur at the initial approach fix from which the approach will be commenced. There is usually a complete depiction in the terminal chart, and most pilots will have no difficulty relating the verbal instructions from the controller with the depiction in the book. How about copying and complying with verbal instructions where no pattern is depicted? Consider the following TACAN holding instructions: "Hold southeast of the 30 DME fix Podunk TACAN 330 radial 8 mile legs." Can you copy, visualize, and correctly enter this pattern?

If you are a little shaky on visualizing the pattern, the following technique is nearly foolproof.

Compare the direction of holding (which is the first item given in the verbal instructions) to the old familiar wind arrow we learned about in weather courses. A wind arrow shows the direction *from* which the wind comes. A north wind is drawn (↓); a southeast wind (↖). Since our holding direction was southeast, draw a southeast arrow (↖). On the head of the wind arrow, place the second item given in the holding instruction, the DME fix. Now we have (↖ **30**). Since the 330 radial was specified, the TACAN station can be drawn on our depiction.



The only items remaining are the right turn at the holding fix (a standard right hand pattern in absence of specific instructions to make left turns) and the leg length. The complete depiction looks like this:



With a little practice you should be able to rapidly draw any pattern as the instructions are received. Have a buddy leaf through a terminal book and give you holding instructions from any TACAN approach chart —try your hand at copying some. ★

GROUND SAFETY AWARDS

PRESENTED BY THE NATIONAL SAFETY COUNCIL FOR

1969



National Safety Council Award of Honor was received by the Air Force in recognition of a 17.72 per cent reduction in ground accident rates during 1969 as compared to the 1967-68 average.

AWARD OF HONOR

This is the Safety Council's highest award and is given in recognition of having achieved 10 per cent (or greater) reduction in ground accident rates when compared to the average of the previous two years. 1969's recipients are:

COMMANDS:

- Air Force Logistics Command
- Air Training Command
- Air University
- Headquarters Command USAF
- Military Airlift Command
- Strategic Air Command
- Tactical Air Command
- United States Air Forces in Europe

NUMBERED AIR FORCES:

- 3 Air Force (CINCUSAFE)
- 12 Air Force (TAC)
- 13 Air Force (CINCPACAF)
- 15 Air Force (SAC)

WINGS:

- 1 Composite Wing (HQ COMD USAF)
- 1 Special Operations Wing (TAC)
- 50 Tactical Fighter Wing (CINCUSAFE)
- 1605 Air Base Wing (MAC)
- 3525 Pilot Training Wing (ATC)
- 3800 Air Base Wing (AU)
- 4600 Air Base Wing (ADC)
- 6921 Security Wing (USAFSS)

GROUPS, REGIONS, CENTERS, AREAS, DIVISIONS, SERVICES:

- 343 Fighter Group (ADC)
- Air Weather Service (MAC)
- Armament Development and Test Center (AFSC)
- Chanute Technical Training Center (ATC)
- HQ Tactical Communications Area (AFCS)
- Oklahoma City Air Material Area (AFLC)
- Pacific Ground Electronics Engineering Installat Agency Region (AFLC)
- Southeast Asia Communications Region (AFCS)

BASES:

- Francis E. Warren Air Force Base (SAC)
- Tachikawa Air Base (CINCPACAF)

AWARD OF MERIT

This is the Safety Council's second highest award and is given in recognition of having achieved a five to ten per cent reduction in ground accident rates when compared to the average of the previous two years. 1969 recipients are:

COMMANDS:
- Alaskan Air Command
- United States Air Force Security Service

NUMBERED AIR FORCES:
- 2 Air Force (SAC)
- 5 Air Force (CINCPACAF)
- 7 Air Force (CINCPACAF)
- 8 Air Force (SAC)
- 9 Air Force (TAC)
- 21 Air Force (MAC)

WINGS:
- 1 Weather Wing (MAC)
- 2 Weather Wing (MAC)
- 3 Weather Wing (MAC)
- 5 Weather Wing (MAC)
- 6 Weather Wing (MAC)
- 7 Weather Wing (MAC)
- 9 Weather Reconnaissance Wing (MAC)
- 15 Tactical Fighter Wing (TAC)
- 17 Bombardment Wing (SAC)
- 23 Tactical Fighter Wing (TAC)
- 33 Tactical Fighter Wing (TAC)
- 41 Aerospace Rescue and Recovery Wing (MAC)
- 55 Strategic Reconnaissance Wing (SAC)
- 58 Tactical Fighter Training Wing (TAC)
- 68 Bombardment Wing (SAC)
- 75 Tactical Reconnaissance Wing (TAC)
- 89 Military Airlift Wing (MAC)
- 313 Tactical Airlift Wing (TAC)
- 317 Tactical Airlift Wing (TAC)
- 320 Bombardment Wing (SAC)
- 322 Tactical Airlift Wing (CINCUSAFE)
- 375 Aeromedical Airlift Wing (MAC)
- 416 Bombardment Wing (SAC)
- 436 Military Airlift Wing (MAC)
- 449 Bombardment Wing (SAC)
- 464 Tactical Airlift Wing (TAC)
- 479 Tactical Fighter Wing (TAC)
- 513 Tactical Airlift Wing (CINCUSAFE)
- 1100 Air Base Wing (HQ COMD USAF)
- 3510 Flying Training Wing (ATC)
- 3550 Pilot Training Wing (ATC)
- 3615 Pilot Training Wing (ATC)
- 3640 Pilot Training Wing (ATC)
- 3646 Pilot Training Wing (ATC)
- 4252 Strategic Wing (SAC)
- 4258 Strategic Wing (SAC)
- 7101 Air Base Wing (CINCUSAFE)

REGIONS, AGENCIES, GROUPS, AREAS, DIVISIONS, CENTERS, SERVICES:
- 1 Combat Evaluation Group (SAC)
- 3 Air Division (SAC)
- 40 Tactical Group (CINCUSAFE)
- 2856 Air Base Group (AFLC)
- 3825 Support Group (AU)
- Aeronautical Systems Division (AFSC)
- Aerospace Medical Division (AFSC)
- Aerospace Rescue and Recovery Service (MAC)
- Air Force Special Weapons Center (AFSC)
- Alaskan Communications Region (AFCS)
- Electronic Systems Division (AFSC)
- Ground Electronics Engineering Installation Agency, Headquarters (AFLC)
- Ogden Air Material Area (AFLC)
- Sacramento Air Material Area (AFLC)
- San Antonio Air Material Area (AFLC)

BASES:
- Barksdale Air Force Base (SAC)
- Cam Ranh Bay Air Base (CINCPACAF)
- Carswell Air Force Base (SAC)
- Davis-Monthan Air Force Base (SAC)
- Dyess Air Force Base (SAC)
- Goose Air Force Base (SAC)
- Kadena Air Base (CINCPACAF)
- K. I. Sawyer Air Force Base (SAC)
- Little Rock Air Force Base (SAC)
- Loring Air Force Base (SAC)
- March Air Force Base (SAC)
- Minot Air Force Base (SAC)
- Misawa Air Base (CINCPACAF)
- Tuy Hoa Air Base, Vietnam (CINCPACAF)
- Westover Air Force Base (SAC)
- Wurtsmith Air Force Base (SAC)

CERTIFICATE OF COMMENDATION

This award is given to small organizations which have achieved a perfect record or have had significant reductions in ground accident rates.

WINGS:
- 6 Strategic Wing (SAC)

GROUPS, SQUADRONS, CENTERS, ORGANIZATIONS, SCHOOLS:
- 708 Aircraft Control and Warning (AAC)
- 709 Aircraft Control and Warning (AAC)
- 717 Aircraft Control and Warning (AAC)
- 748 Aircraft Control and Warning (AAC)
- 926 Tactical Airlift Group (AFRES)
- 928 Tactical Airlift Group (AFRES)
- 1604 Air Base Group (MAC)
- 3826 Command and Control Group (AU)
- 5071 Air Base Squadron (AAC)
- 7122 Broadcasting Squadron (CINCUSAFE)
- 7234 Ammunition Supply Squadron (CINCUSAFE)
- 7350 Support Group (CINCUSAFE)
- Academic Instructor and Allied Officer School (AU)
- Air University Institute Professional Development (AU)
- Arnold Engineering Development Center (AFSC)
- Military Aircraft Storage and Disposition Center (AFLC)
- Space and Missile Systems Organization (AFSC)
- Tactical Air Reconnaissance Center (TAC)

Ops topics



FEATHERED BULLETS

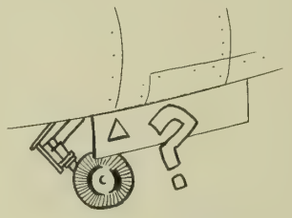
With the fall migration season coming up there are going to be a lot of birds moving around so it would behoove aircrews to be extra alert to them. But this doesn't mean that we can ignore them during the rest of the year between migrations. That birds are everywhere is common knowledge. We were reminded of this the other day when the daily message traffic contained several reports of birdstrikes. A few: From California, a B-52 on takeoff took a bird in the Nr 7 engine. The cost was in excess of $35,000. In Georgia another feathered bullet smacked the right wing leading edge of a C-119 and an eight-foot section had to be replaced. Two RF-4s were hit in South Carolina one receiving only minor damage to the vertical stabilizer, the other much more serious in that the nose cone and practically all of the equipment contained therein had to be replaced. All of these happened at low altitude. Obviously there wasn't anything the pilots could do to avoid these encounters. We'd like to offer some effective words of wisdom but about all we can do is remind those who have visors to keep them down in the environment in which birds operate. There's no guarantee with it, but there are jocks flying today who might not be with us if it hadn't been for that bit of plastic.

BROTHER'S KEEPER

Someone had made a hard landing after the wheel was assembled and installed on the T-39. That had been 23 landings ago. On the day that the rim failed, the aircrew had made multiple touch and go landings during a training mission, but none of them were what you'd call hard landings. Actually, they didn't even know the 1½ x 14-inch strip had broken off the right main wheel rim until they parked, deplaned and were making a cursory post flight inspection.

Maintenance inspectors checked the rest of the wheel by Zyglo and ultrasonic methods and found other cracks, confirming that the wheel had seen some pretty rough treatment. They theorized that the strip actually broke away from the rim on the last landing at home base. Probably on roll out from the landing, as a matter of fact, because only the tire bead was holding the tire on the rim across the break, preventing a blow-out.

Fortunately, the rim didn't break at high speed. And fortunately again, the pilots didn't attempt another landing after the wheel had broken. Unfortunately, they came mighty close to a serious accident because another pilot, too proud to admit a minor error, failed to ask for an inspection after he made a hard landing.



GEAR UP?

In the pattern for landing at the end of a mission, the 0-2A pilot lowered the gear handle and found a yellow "in-transit" light staring him in the face. The main gears were down, but the light persisted, even though he moved the gear handle back and forth several times between the DOWN and DOWN-NEUTRAL positions.

Leaving the handle in the DOWN position, he notified Tower that he would be landing with an unsafe indication. He was assuming it was only a faulty indication—that the gears were actually all down and locked.

The assumption was erroneous, as you might expect. Touching down short of the arresting gear cable, he held the nose off until he'd passed the cable, then eased the nose down. And down — — and down. The front prop stopped very suddenly. The airplane came to a stop shortly thereafter.

It wasn't until he was telling his tale of woe to the Ops Officer that the real problem came to light. He

had experienced some difficulty with the gear after takeoff. Like the gear handle wouldn't come up past neutral because the nose strut had not fully extended (leaky inflation valve). He solved that by putting some G on the airplane, AND THEN RETRACTED THE GEAR!



PRACTICE

During a complicated, high altitude intercept in weather and turbulence, an F-106 pilot experienced lightheadedness and felt that things around him were unreal. Thinking he might be hypoxic, he started an emergency descent, checked his oxygen pressure and cabin pressurization and then tried to activate his emergency oxygen bottle. But he couldn't locate the green apple!

Passing 10,000 feet in the descent he began to feel better. By the time he was in the traffic pattern the pilot was back to normal and he landed without difficulty. Taxiing in, he held the mask away from his face and felt the flow of oxygen under pressure coming from it. Next he reached for the green apple—and located it without difficulty the first time.

Lesson: Your reach for—and location of—the emergency oxygen bottle green apple must be as sure and automatic as your reach for the ejection handle. When you need either one, you will be under severe stress and possibly partially disabled. The only way to assure that you'll locate these life-saving devices is practice, practice, practice.

THANKS A LOT!

F-4 from another service pulled up alongside of tanker to "thank tanker crew for fuel received". The F-4 was tucked in so close that the tanker navigator had to raise his seat to read the F-4's tail number. Then the F-4 pilot added military power to pull away.

F-4 tail section struck right engine of the tanker, then the radome. Jet exhaust then blew out the tanker windshield, injuring the pilot's and nav's faces. The collision apparently blew the third crewman out the top, along the ECM panel. Tanker pilot and nav bailed out successfully. Third crewman was not found. F-4 diverted and landed at a divert field.

Better recall that man's credit card.

FLIP CHANGES

Effective 20 August 1970, DD Form 175 instructions were revised. Significant changes have been made to the Stopover Flight Plan Procedures. See FLIP Planning Section II, North and South America.

As of 23 July 1970, the Military Training Route Charts in Section IIA will be distributed every 12 weeks. The booklet giving textual descriptions will continue to be revised every four weeks. Additionally, Section IIA has been designated as the primary source document for operation planning for the use of All Weather Low Altitude Routes. Concurrently, narrative information on Oil Burner and Heavy Wagon Routes will be removed from the FAA Airman's Information Manual.

LONG LANDING, SHORT RUNWAY

A C-7 was engaged on routine resupply to an airstrip in Southeast Asia. On the fifth landing of the day at that strip, the aircraft overran the runway and came to rest just beyond an embankment. The left main gear folded; the left engine and propeller were damaged. No materiel deficiencies were found in the propeller reverse or wheel braking systems. The primary cause was pilot factor; pilot used improper procedures which prevented a safe go-around and increased landing distance beyond the available runway.

Sqn Ldr Donald Melvin
Directorate of Aerospace Safety

Ops topics

CONTINUED



FIRE

Five minutes after level-off on a tactical airlift of cargo and passengers in Southeast Asia, a C-7A experienced manifold pressure and rpm fluctuations and noticeable vibration on Nr 2 engine. Zone two and three fire warning illuminated, and the flight mechanic reported flames coming from the engine cowlings. The engine was secured, and both fire bottles were required to cancel the fire warning. The aircraft landed safely 15 minutes later.

Investigation revealed that Nr 2 cylinder was split across the top, releasing the fuel/oil mixture and creating the subsequent fire and damage.

The photograph shows the extent and severity of the fire. This critical situation was controlled by prompt and faultless emergency procedures on the part of the aircraft commander and his crew. Can the same be said about your Dash One procedures?

Sqn Ldr Donald Melvin, RAAF
Directorate of Aerospace Safety

ANOTHER CHANCE

The pilot of this U-3A was scheduled for a 2 + 30 local proficiency flight; however, no specific route, altitude, or maneuvers were assigned. A local VFR flight plan was filed for 2.5 hours with five hours of fuel on board. Preflight and takeoff were normal and the pilot proceeded to fly a round-robin cross-country in the local area. After approximately 1.5 hours the pilot rolled into a 50-60 degree right bank at 150 mph indicated airspeed. During the turn he felt a sharp jolt and the aircraft rolled to near inverted. Before recovery could be completed, the aircraft hit some trees and ricocheted back into the air. The pilot checked for damage and initiated a climb toward the home base where he landed uneventfully about 15 minutes later. Primary cause of the accident was pilot factor.

The investigation revealed the following: the pilot was flying cross-country in the local flying area (150NM radius) without specifying route of flight. The pilot's home town was one of his enroute check points. Accordingly, it is significant to note that a 33 minute discrepancy existed between the time required to fly the route, as reported by the pilot, versus the enroute time determined by the investigating board.

Minimum altitudes on low level navigation flights had not been established. Fuel management was unsatisfactory. Fuel at landing was as follows:
Right main—10 gal, Left main—2.75 gal, Right auxiliary—4.3 gal, Left auxiliary—14 gal.

The impact area could not be located although a thorough search was accomplished in the area specified by the pilot.

LESSON LEARNED—Low level maneuvering of aircraft is *still* dangerous, and adequate supervision of all aircraft operations is necessary.

Lt Col Thurman Lawrence, Jr.
Directorate of Aerospace Safety

the $25,000 nut



Note nut lying on top of bolt.

THE RIGHT WING SMOKING AND MISSING ONE TAILPIPE, THE B-57 CREW SET THEIR BIRD BACK ON THE RUNWAY.

Shortly after takeoff the B-57's Nr 2 engine overheat light started flashing. Then the pilot and navigator heard a loud thump and felt the airplane yaw to the right. When the pilot reduced power on Nr 2, the overheat light went out. He declared an emergency and headed for the ordnance jettison area. Each time he cautiously attempted to advance power on the bad engine, the overheat light came on at 85 percent—he decided to leave it at idle.

The bombs came off clean and the trip back to the pattern was without further incident. But when the pilot lowered the gear, the troublesome overheat light began flashing again. Only seconds from touchdown, and not knowing what had caused the thump and yaw, he decided he might need Nr 2 for directional control during the landing. He left it running until the landing was assured.

On the ground and clear of the runway, the crew shut down and unstrapped. At about the same time ground personnel saw that portions of the right wing were cherry red. The fire department cooled the wing with water so armament people could dearm the weapons.

Then the maintenance folks got a chance to check Nr 2 engine. And right away they found that the tail pipe was missing! Checking further, they found that a self-locking nut on one of the two tailpipe clamps had not been installed during the last engine change. The engine installation had been signed off by a mechanic; the inspection was signed off by a qualified (?) inspector.

Heat damage to the right wing was so extensive and severe that the entire wing had to be replaced—at a cost of $25,000 in manhours alone. ★

AIR AND WATER POLLUTION

What the Air Force is doing to improve our environment

The problems of pollution are not new, but they have recently taken on greater significance to those of us in government service. Last February, President Nixon, recognizing that the Federal Government has become one of the nation's worst polluters, issued an Executive Order to remedy the situation. The new Executive Order expands the scope of the pollution abatement program; the definition of facilities is broadened to include equipment, aircraft, vessels, and other vehicles. It requires identification of potential problems from new materials or processes and control of the resulting pollutants. The President has stated that his basic policy is that the Federal Government will take the lead in abatement procedures.

The new order enjoins federal agencies to avoid or minimize waste; this requirement encompasses the storage and handling of solid fuels, ashes, and petroleum products, as well as the prevention of spillage of pollutants. It encourages activities such as recycling of waste waters and the use of waste heat such as the Air Force is employing in its new electric power plant at Sunnyvale, California. There heat from gas turbines is being used with absorption chillers to produce more than 1,200 tons of air conditioning.

The new Executive Order 11507 requires pollution abatement in both existing and new facilities, with all existing facilities undertaking actions to bring them up to current standards by 31 Dec 1972. If the new facility will generate pollutants, any planning for new facilities must include provisions for abatement procedures, and the cost must be included in the overall cost.

In recent years, the Air Force has had numerous actions and programs dealing with pollution abatement for fixed facilities and in 1966 all Air Force installations were surveyed to determine water and air pollution deficiencies. These deficiencies were translated into a phased program that included not only Military Construction Program (MCP) projects, but also Organization and Maintenance (O&M) efforts.

The water pollution abatement program deals with both sanitary and industrial waste, to include the collection, treatment, and disposal of liquid wastes. The following 5 year program chart gives a good idea of the scope of this abatement program:

WATER POLLUTION ABATEMENT FACILITIES
($ Millions)

Program	FY 67-70	FY 71	FY 72	Tot
MCP	19.8	12.8	19.0	51
O&M	1.8	0.6	0.5	2
Industrial	3.5	0.3	—	3
Total	25.1	13.7	19.5	58

The money for water pollution abatement has been or will be spent on expanding and improving existing plants, constructing new plants, and providing new or improved collection systems. At the present time, the real property value of our water pollution facilities is approximately $250 million, or two percent of our total real property inventory, an excellent demonstration of increased OSD interest in pollution abatement.

The present air pollution abatement program again deals with fixed facilities, principally heating plants and waste incinerators.

AIR POLLUTION ABATEMENT FACILITIES
($ Millions)

Program	FY 67-70	FY 71	FY 72	Total
MCP	5.3	1.3	25.1	31.7
O&M	1.6	2.3	2.7	6.6
Industrial	1.6	0.4	—	2.0
Total	8.5	4.0	27.8	40.3

The air pollution program is not quite as large as the water pollution program and execution has lagged due to a lack of standards. As standards become more firm, we can anticipate changes in the FY 72 air pollution program.

In addition to the water and air pollution abatement programs described, the Air Force has been active in the following areas: reduction of waste materials, improved disposal of solid wastes, improved operator training and proficiency, increased emphasis on the control and use of herbicides and pesticides, and in research and development of pollution control activities.

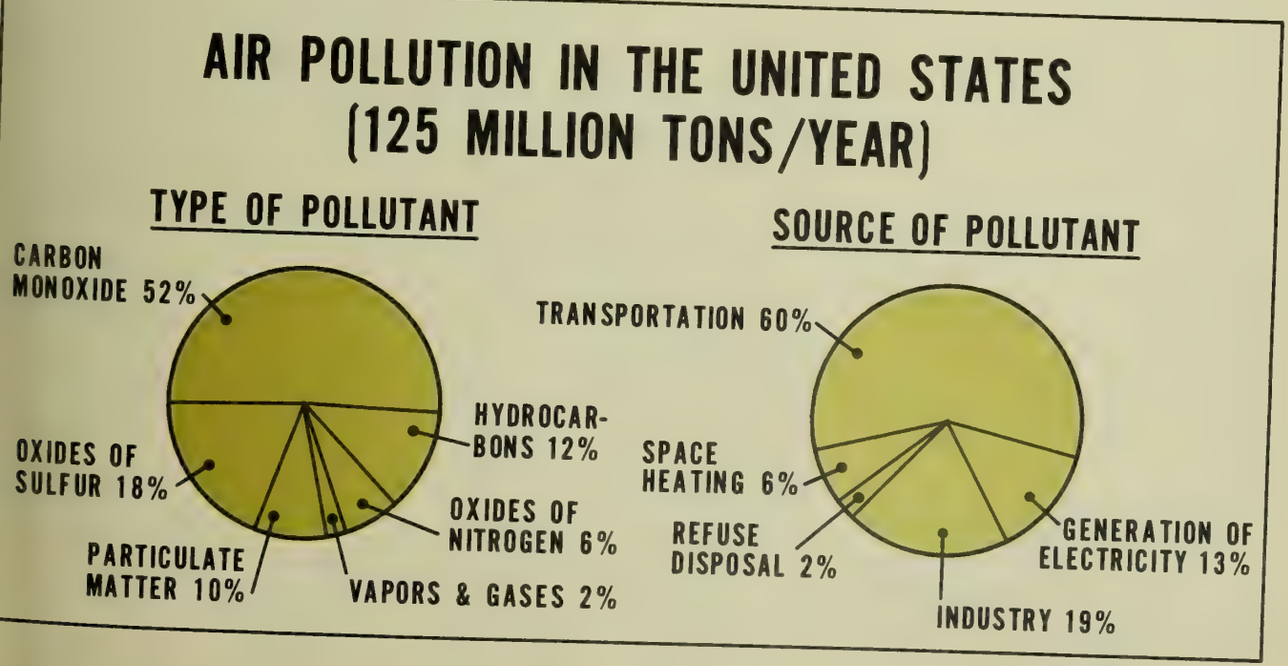
New Air Pollution Areas (Aircraft and Vehicles)

Before discussing the aircraft and vehicle contribution to air pollution, it would be well to review the type and source of air pollutants:

It is readily apparent that the burning of fossil fuels and the transportation industry, with its vast number of internal combustion engines, are the heart of the air pollution problem. Although the pollution from aircraft is only approximately 1% of the transportation contribution, this 1% takes on a more meaningful impact in the immediate areas of military or commercial airfields.

The pollution problem from aircraft has been accentuated by the introduction of jet aircraft engines; therefore, the Air Force must play a leading role in abating jet engine pollution since we possess 60% (32,000) of the nation's jet engine inventory. The jet engine, with its high-temperature combustor, produces nitrogen oxides, hydrocarbons, and other pollutants.

Until recently, adverse public opinion has been mostly in terms of



the aesthetic aspect of the problem; however, the National Emissions Standards Act, introduced by Senator Muskie, extends the coverage of the Clear Air Act to include aircraft and vehicles. Under this Act, the Department of Health, Education, and Welfare will be empowered (in coordination with the Secretary of Transportation for Safety) to establish standards and to enforce them.

In anticipation of this enforcement, the civil aircraft industry is developing engine combustors that do not smoke; the B-1 and F-15 aircraft will not be "smokers." Pratt and Whitney has developed modification kits for the JT8D engine (727, 737, and DC-9 aircraft) for smoke elimination. These modifications, about $4,500/engine, consist of leaning the fuel/air mixture and changing the hole pattern in the forward part of the combustor.

The initial Air Force research and development in pollution abatement from aircraft stemmed from the need to eliminate smoke to reduce detection by the enemy, with emphasis on the J-79 engine (F-4 aircraft) because of its use in Southeast Asia. Fuel additives have been tried, not too successfully. The other approach would be to modify the combustors. The Air Force is currently working with General Electric for design modifications of the J-79 engine that will cost approximately $35 million for fleet conversion, and also an improved combustor design for the TF-39, which powers the C-5 aircraft. The cost of modifying 81 C-5 aircraft for smoke abatement will be approximately $5 million. It should be noted, however, that the present state of technology limits all these modifications to smoke elimination and will not reduce other pollutants that are probably more noxious.



Aircraft engines produce about 1% of the transportation contribution to air pollution. Air Force and industry are working to reduce emissions.

The nation's No 1 air pollution problem, however, is the automobile. There are approximately 83 million automobiles, 17 million trucks and 500,000 buses in the United States; the Air Force has 165,000 motorized vehicles, power generators, and various types of aerospace ground equipment. So, we in the Air Force are only a small part of the nation's vehicle problem. The National Emissions Standards Act covers motor vehicles and charges HEW with developing standards; the development of measurement devices and means of enforcement have been the major factors delaying development of standards. Industry has included positive crank case ventilation in all new cars since 1968 and combustion has been improved through better engine timing. The Air Force is following the lead of industry and is emphasizing proper maintenance as a means of reducing pollution associated with our vehicular fleet.

In terms of research and development, the President's environmental message to Congress said that we must begin research on an unconventionally powered, low pollution automobile by 1975 if we cannot clean up the internal combustion engine. Research by industry is already under way on gas turbine, steam, electric gas, and dual fuel vehicles.

So, we now see that the Air Force is indeed quite concerned about environmental pollution. The policy of the Air Force can be stated as "providing leadership in prevention, control, and abatement of environmental pollution by accelerating corrective measures at Air Force installations and by cooperating with local communities in developing and pollution abatement programs."

This article was based on excerpts from a pollution abatement briefing presented to the Air Staff by Brigadier General Reilly, Deputy Director of Civil Engineering. Gen Reilly is now designated as Air Staff coordinator for pollution abatement.
—Ed.

DON'T BOTTLE IT UP



THERE ARE **9** OTHER PEOPLE
WHO WANT TO SEE
AEROSPACE SAFETY



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LOST and DOWNED

BRIEFS OF RECENT AIRCRAFT ACCIDENTS

OV-10 The pilots of an OV-10 and an RF-4C mutually agreed to an unauthorized post mission rendezvous for some air-to-air photography. Both pilots assumed standard separation criteria would be maintained and did not bother to pre-brief formation procedures. All went well until the OV-10 was positioned directly beneath the RF-4 for some vertical photos. Both pilots lost visual contact with each other and the aircraft collided. The RF-4 recovered with minimum damage; however, the OV-10 pilot had to eject.

F-100D Shortly after making a high gross weight takeoff, Lead made a 30 degree bank turn to avoid a thunderstorm. The wingman failed to see Lead initiate the turn and got out of position. To regain position he had to make a tight turn. To avoid a weather buildup, he continued to tighten the turn until the aircraft stalled. Stall recovery controls were applied and the aircraft entered the clouds. The pilot was unable to regain control and ejected. Pilot failed to maintain visual contact with Lead, stalled the aircraft and was unable to recover from an unusual attitude. Correct flying techniques, at any one of three stages, would have prevented loss of the aircraft.

F-106 Target aircraft was at 49,000 feet as part of a strike force in support of an air division exercise. The F-106 pilot was working with a high gross weight airplane, requiring at least 1.23 mach for normal maneuvering in this environment. The required maneuvers were not normal, his indicator was .93 mach, the stall was sudden, the spin was flat, the ejection was successful.

F-4D Due to altimeter malfunction, the Aircraft Commander executed a missed approach from a GCA. While in a right hand pattern for a second approach, he inadvertently shut off the left engine master switch. The aircraft went into a left bank and the AC ordered bail out but he failed to eject within the safe envelope and was fatally injured. The AC mistakenly turned off the left engine master switch rather than the static pressure correction switch. After inadvertently shutting off the engine, he failed to use correct emergency procedures and lost control. Improper procedures and techniques turned a minor incident into a fatal error.

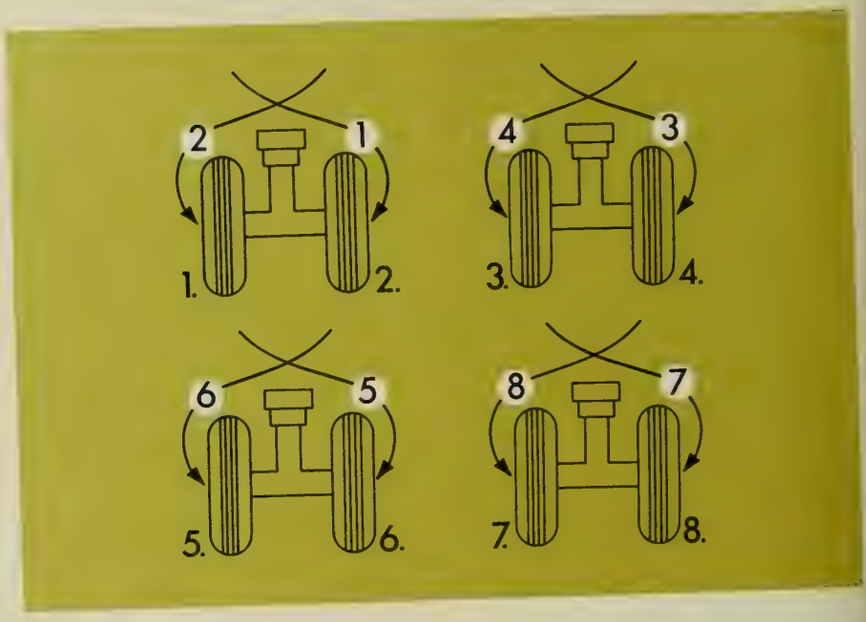
REMINDER

U.S. aerodromes/facilities times of operation reflect Greenwich Mean Time (GMT) expressed as "Z" time. Daylight Saving Time is in effect from 0200 local time the last Sunday in April to 0200 local time the last Sunday in October at all aerodromes in the conterminous U.S. except Arizona and Michigan. During this period, the aerodromes/facilities operate one hour earlier than the "Z" times indicated.

Tech topics

BRIEFS FOR MAINTENANCE TECHS

cross up



YOU HAVE HEARD the old saying, "He got his wires crossed." I'm sure there is at least one B-52 crew that will remember a tale about crossed wires for some time to come.

The big bomber blew a tire on second application of the brakes. This happened with anti-skid on. It subsequently blew three more tires in close succession with the anti-skid still on. With 3000 feet of runway left, the pilot turned the anti-skid off and brought the big bird to a safe stop without further incident.

Investigation revealed that Nr 8 tire had blown first, followed by Nr 1, then 5 and finally Nr 4. Inspection of the anti-skid electrical system revealed the wires crossed at all four main struts. This cross-wiring caused one wheel of paired wheels to respond to the anti-skid detector of its mate. Thus when the anti-skid detected a skid on Nr 1, it would release pressure on its mate, Nr 2, allowing it to run free (unbraked) and feed full pressure to Nr 1. Result: a blowout. Records indicate there had been nine separate maintenance actions performed on the landing gear system, in the prior three months, with no reference to any wiring problems. However, proper tech data procedures could have prevented this incident. ★

flameout

WHILE A STUDENT in a T-37 was performing a pitchout during traffic pattern stall series, the left engine flamed out. A normal restart was accomplished, and they RTB for a landing. However, when the student retarded the throttles for landing, the left engine flamed out again.

The problem turned out to be a clevis pin that was missing from the left throttle in the center throttle quadrant. With this throttle discon-

nected, the idle stop feature was eliminated and as the student retarded his left throttle to the lower stop, it placed the fuel control in the off position. Further investigation revealed that when TCTO 1T-37-569 was completed, the cotter pin was omitted at the connecting point between the push rod assembly and bell crank.

This is an example of the kind of maintenance goof that can cause a disaster. That's why we have inspectors. Where was the one who should have caught this error? ★



tidy up the office

USUALLY the letters FOD conjure up visions of jet engines gulping tools left in intakes or junk dropped on the ground. And that is serious business. Equally serious is the foreign object left in the cockpit. To illustrate:

• The right engine of a T-37 flamed out at 17,000 feet and couldn't be restarted. The problem: a piece of cotter key left in the cockpit. When it got across terminal studs 3 and 4 on terminal strip 33 behind the IP's seat, it caused a short circuit which closed the fuel valve.

• Another T-37. During a high speed dive recovery the student attempted to retard the throttles to idle but the left throttle had a mechanical block at 80 percent. It would move forward all right, but not back. After landing, the engine was shut down with the fuel T handle. The cause: a loose metal cap had lodged in the left quadrant and restricted throttle movement.

• On three different occasions pilots encountered flight control problems in an F-106. The first two resulted in ground aborts. In one case a binding magnetic damper was replaced and an FCF flown okay. A few days later a pilot ground aborted again with a binding stick. After he cleared the runway he could not duplicate the malfunction. Maintenance replaced the hydraulic elevon pack valve and the artificial feel unit. A successful FCF was flown. The aircraft then flew three sorties with no discrepancies. The third control problem occurred during flare for landing. Fortunately, the pilot was able to land okay and a depot flight control team dug into the airplane. They found a stray ¾ in. bolt under the floorboard was causing the trouble.

After you fix it up, CLEAN it up! ★



flashing light

AN F-101 PILOT was working a target area when the Number Two engine burner compartment overheat warning light came on. The throttle was reduced to idle, but the light continued to flash. The engine was then shut down, and the pilot made a single engine recovery at an alternate base.

Inspection of the warning system revealed a defective lower aft overheat warning loop. The loop had been recently inspected during other maintenance and apparently had been bent or kinked at that time, causing a reduced resistance in the line. After the defective loop was replaced, the aircraft was flown to its home station without further fire warning problems.

Fire warning systems perform an extremely important function and should be treated with great respect. Do the crew, the Air Force and yourself a service by making sure they are not damaged during other maintenance. If the circuit is damaged inadvertently, get a competent person to inspect and make any necessary repairs.

Tech topics

CONTINUED



for want of a nail - - -

WE ALMOST LOST one of our attack aircraft the other day for a strange reason. Would you believe that a voltage regulator could be involved in the chain of events that led to a complete hydraulic failure. It seems that a Dzus fastener was missing from the cover of the regulator. The cover shifted, thus allowing a shock mount screw to chafe against a hydraulic pressure line. It took weeks, but the line finally wore nearly through. When the pilot actuated the speed brake, the pressure demand ruptured the line. The cockpit filled with smoke and fumes, but luckily there was no fire and a successful emergency landing was made. The incident report says that maintenance and supervisory personnel were briefed on this occurrence and that emphasis was placed on quality workmanship and supervisory responsibilities.

Let's hope that the lesson will be remembered as a perfect example of how a seemingly unimportant item nearly caused the loss of an aircraft. Remember the horseshoe nail that lost a war? ★

(Lt Col Robert Picht, Directorate of Aerospace Safety)

that sinking feeling -- FOD

While servicing an F-101 landing gear accumulator, a mechanic left a wrench in the intake area. An intake inspection was made but the wrench was overlooked. After about three minutes of engine operation, unusual sounds were heard. The engine was shut down and the wrench was found. Only $30,000 worth of damage had occurred. Only $30,000 for one little wrench!

Too bad all personnel who work in areas where FOD is a potential killer can't experience the sinking feeling that this mechanic must have felt, without going through the actual experience. There would surely be a lot less FOD. ★

ignorance is costly



DURING A C-141 functional check flight the landing gear system was being checked for proper operation in accordance with TO 1C-141A-6CF-1CL-1. The aircraft configuration was flaps—takeoff and approach, landing gear up and locked. Airspeed was maintained at approximately 160 knots. Upon activation of the emergency extension system for the left main gear, following extension of the right main, the flight engineer in the cargo compartment observed a large quantity of hydraulic fluid on the floor in the vicinity of the Nr 2 hydraulic reservoir and found it had ruptured and the Nr 2 hydraulic system was no longer operable. The nose gear was extended by the emergency extension system, all three gears were pinned down and the aircraft was landed without further mishap.

Someone had placed a threaded metal cap on the hydraulic reservoir relief valve, causing pressure to build up in the reservoir. Since the reservoir was designed for only 28-35 psi, it probably ruptured during gear retraction when it was subjected to overpressure.

Placing a metal cap over the exposed threaded area of the hydraulic reservoir relief valve would be a logical mistake for someone who didn't know what he was doing. But how come we have people working on our multimillion dollar aircraft who don't know what they are doing? ★



look ma--no brakes

STRAPPED IN and fired up, the -106 pilot started to taxi out for keoff. The brakes checked good he pulled out of the parking spot. bout two minutes later, as he tried slow down, he found that the edals went all the way to the floor -and the bird didn't slow one bit!

Some good, fast thinking prompted him to call Tower for immediate clearance onto the runway when he saw he couldn't stop in the runup area. Then, going down the runway he did everything he could think of to bring the airplane to a stop; pumped the brake pedals 'till his legs were sore—and then some. Finally, with 2000 feet to go to the BAK-12 arresting gear, he lowered the hook and made an uneventful, ten-knot arrestment.

Unfortunately, the F-106 doesn't have a backup or emergency brake system. And unhappily, the crew chief set this one up (it could just as easily have been a real messy accident) by allowing air to enter the brake system when he serviced it with hydraulic fluid. ★

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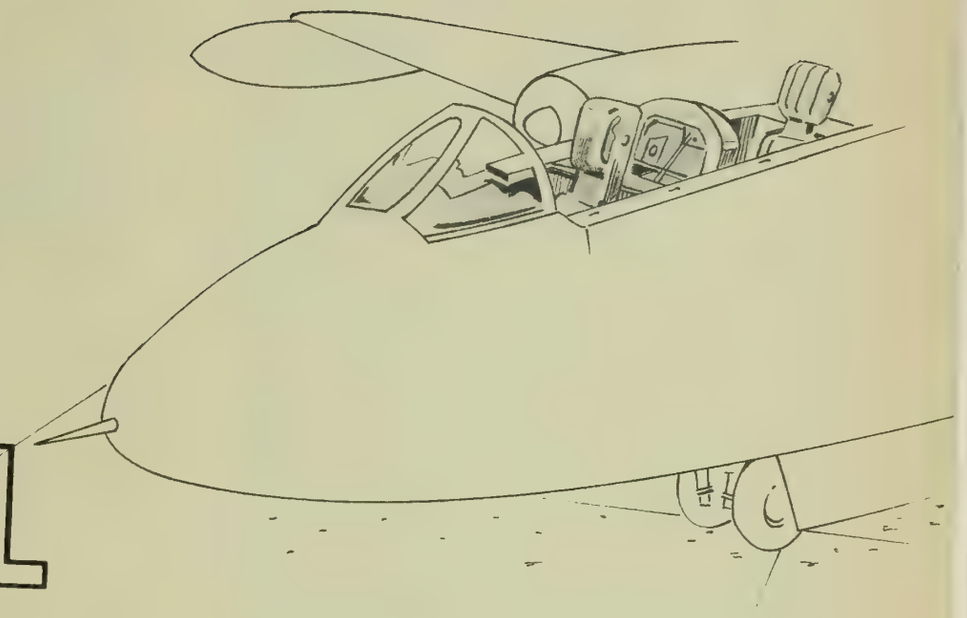
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Courtesy Det 1, 17th Weather Squadron
Tinker AFB, Oklahoma

JACK OF ALL TRADES



The thing that makes transient maintenance such a demanding job is the great diversity of equipment that you have to work with. Most of us—aircrew types, ground maintenance types or specialists—are associated with only one airplane at a time. After only a short get-acquainted period, we learn the eccentricities and peculiarities of that one bird. We learn where the danger and trouble areas are.

Not so for the Transient Alert types. Parking, servicing and starting many different types of aircraft every day, they quickly learn a cautious approach to business. Their secret to success must be something like: If you don't know it, don't touch it—until you've looked it up and understand it. Until you know a complicated machine like a modern airplane, you have no way of telling what will happen when you pull this little knob or push that little button. Even though you've seen a knob or button just like it on another airplane—and know just what it would do on that other airplane—you have no assurance it will do the same thing on this unfamiliar airplane.

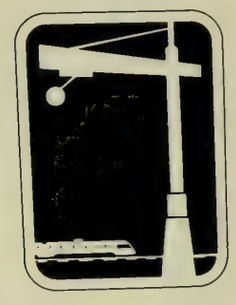
Take a case in point. It's an old story, has happened more times than I'd like to recall, but it just happened again recently.

B-57 had been parked on the transient line for about a day awaiting parts for a radio write-up. A comm-nav troop went to TA looking for the aircraft forms and was told they were in the cockpit of the B-57. Nobody offered to go to the airplane to assist him. When he reached the bird, he found the canopy closed. He found some instructions about the canopy printed on the side of the fuselage and followed them—opened the access panel, grasped the T-handle, unreeled the cable and pulled gently —until the canopy jettisoned!

You say he should have known better? He'd never seen a B-57 before. But yes, he should have known better than to touch, open, pull, push or handle anything on that B-57 until he was certain it would do what he wanted it to do.

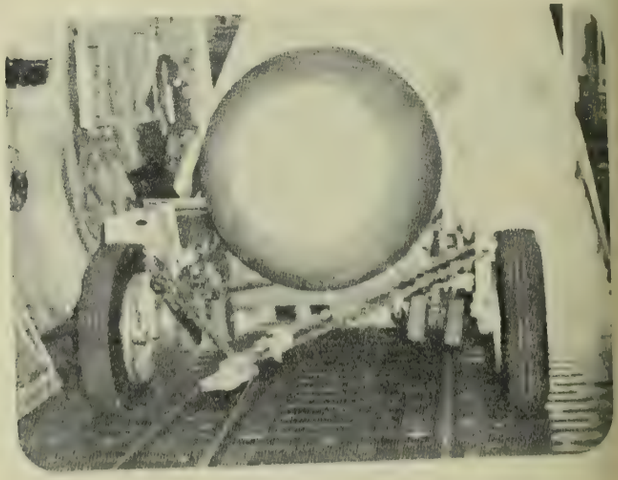
The Transient Alert troops should have known better, too! When the comm-nav specialist walked in looking for the forms, they should have accompanied him out to the airplane. Hopefully, *they* would not touch, open, pull, push or handle anything on the bird without knowing exactly what it would do. ★

NUCLEAR SAFETY AID STATION



STOP, LOOK, AND LISTEN

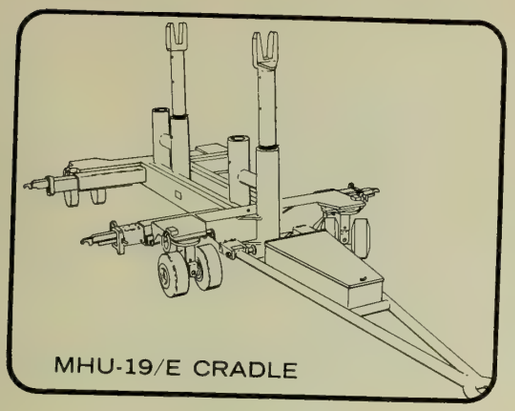
During loading and unloading operations on the C-141A, several separate problems have arisen around the winch and associated equipment. In one instance, due to improper repair and maintenance, a winch failed and the winch cable broke while pulling an MHU-7/M trailer loaded with nuclear weapons up the ramp. Proper maintenance and load crew inspection of equipment would have rejected the winch and the cable would not have broken. In another instance, the improper installation of a whiffletree snatch block to the floor resulted in the installation failing during off-loading. In a third case, while pulling an empty MHU-7/M trailer up the ramp to off-load a weapon, the cable came off the track of the whiffletree snatch block and cut the cable severely, requiring a cable change. Proper installation of the whiffletree snatch blocks to the floor attachment devices would have prevented the two latter problems.





HERE WE GO AGAIN

Both break pins sheared when a B43 weapon was lowered by the MJ-1 lift truck prior to release of the F-104 forward trapeze. Apparently, the load crew chief did not verify that all preceding steps had been accomplished prior to proceeding to succeeding steps. Another team was decertified. How many times have you heard "FOLLOW THE CHECKLIST!"


MHU-19/E CRADLE

BOLSTER BENDS BOMBS

How can a post of an MHU-19/E cradle dent a weapon in an MHU-20/C clip-in? You can probably think of many ways, but one of the most improbable happened recently. After the MHU-20/C was secure in the B-52 bomb bay, the MHU-7/M trailer was lowered until the posts of the cradle cleared the dovetail blocks of the clip-in. At that time, there was sufficient lateral movement of the cradle to allow the aft post to strike a weapon. Why? Because the aircraft was not level with the ramp and misalignment caused side pressures on the trailer arms. This pressure was released as the cradle was lowered and the lateral movement occurred.

The misalignment was probably due to a 5-thousand pound fuel imbalance and the fact that the front wheels were turned at a 45 degree angle. The technical order doesn't say much about fuel imbalance or wheel position, but why not have the best conditions possible? Don't try working in less ideal conditions than are really necessary. You can't control the weather, but maybe you can control aircraft position. When you have to make large corrections on the trailer to get proper alignment of the clip-in with the bomb bay, you may want to take another look at the situation.



UNAUTHORIZED PROCEDURES-BEWARE!

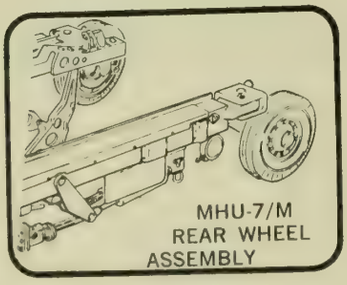
A reentry vehicle (RV) had been demated from the missile and was being prepared for movement to a support base. The Coles crane swung the RV to position it over the RV transporter and in the process hit the support frame assembly of the RV transporter causing damage to the RV ablative shield. The RV team failed to allow adequate clearance between the RV and the transporter support frame assembly. Investigation revealed that the RV handling procedures used were untested and not in consonance with approved TO procedures. Fortunately, no serious damage occurred; however, it cannot be overly emphasized that only USAF-approved procedures should be used when handling RVs. Carelessness coupled with the use of unauthorized procedures can only lead to trouble. BEWARE!

NUCLEAR SAFETY AID STATION



MUDDY ROAD AHEAD, USE CARE!

Two RV vans at two different locations recently had their rear wheels drop off the shoulder of the road into deep mud. Heavy rains had caused the soft road shoulders which normally would not have given away. Had the vans tipped over, the various potential safety hazards are evident. Drivers, when road conditions deteriorate, be *extra* alert, use caution, and exercise to the maximum your expertise in which the USAF has placed its confidence.



MHU-7/M REAR WHEEL ASSEMBLY

MHU-7/M TORQUE TROUBLES

Would you believe that the loss of all ten lug nuts from the rear wheel of an MHU-7/M trailer will result in separation of the wheel from the trailer? It has now been proven by actual test! The test was unintentional and the wheel came off when the trainer-loaded trailer was being returned to the MMS area. All ten nuts were recovered within 200 feet of the point of wheel separation, which occurred just beyond a 90 degree right turn. Following the incident, some tests were conducted and the problem was duplicated sufficiently well to determine a most probable cause. The rear lugs were torqued to the same value as the front lugs (840 in-lb instead of 1200 in-lb), and the nuts loosened when the trailer was towed about four miles. This trailer also had left-hand threaded lug bolts on the right side so the loose nuts would have been driven off the bolts. Two improbable minor problems joined forces to create an incident. You can help prevent this type of problem by complying with torque requirements and being alert for little things like left-hand threaded bolts on the right side.



TIRED? BE ALERT AND CAUTIOUS

During download of a reentry vehicle from a reentry vehicle/guidance and control van at the storage area, the lightweight spacer attaching brackets were sheared. After downloading, inspection revealed that the spacer adapter ring had not been aligned properly allowing the adapter ring to rest on the lightweight spacer brackets. Result? The attaching brackets were completely sheared. A contributing factor to this incident was probably crew fatigue. The crew had been on continuous duty for 12½ hours. Fatigue and misalignment become blood brothers, given sufficient time. Only alertness and caution to the end of the job will conquer such hazards.



WET FEET

Preparations were made to move a B43 on an -695A Bomb Handling Truck from the maintenance d inspection building to a storage igloo. The tug d been backed to within approximately two inches the tow bar preparatory to hookup with the tug's ıtle hook. The tug had been stopped on the outside a slightly elevated lip of concrete at the entrance to the maintenance bay. As the tug driver backed the tug over the concrete lip to hook to the tow bar, it slowed perceptibly, then accelerated backward. The tow bar was shoved to the floor and scraped the weapon as it was pushed aside about 45 degrees. The maintenance team member holding the tow bar injured his knee while attempting to get out of the way. The tug had been outside where it had been raining and the brake pedal and driver's shoes were wet and slippery. While backing over the concrete lip, the driver's foot slipped from the brake to the accelerator, causing the tug to lurch backward at a most inopportune time. Several cases of this type have been reported which resulted from a combination of slippery brake pedals and shoes. In this case, a man was injured and a weapon was damaged. When shoe soles are wet, take special care when driving any vehicle.



MAIL CALL

POMOLA

Reference your February 70 issue, page 5, the POMOLA.

Possibly you will recall that during World War II we used a somewhat similar system, especially effective at night. It consisted of three lights mounted vertically. (Somewhat similar to some of the angle of attack indicators used in some aircraft.) A high approach could see only a yellow light, a low approach could see only red light, while a proper glide slope could see the "GREEN." I enjoyed using it in an area of comparative blackness, such as that found in isolated areas. It should be most usable anywhere in the world at a very low cost—and it is most effective.

B. L. VerSteeg, LtCol (Ret)
SAAMA, Kelly AFB, Texas

POOR CAMOUFLAGE

Though not in the aircrew, maintenance or support area (I'm a ground radio maintenance type), I am an aviation nut and enjoy reading all material on aviation, both military and civilian. I read every copy of your magazine I can find and have been a Rex Riley fan for years.

This may have been brought to your attention already, but I think you should have your illustrator for the "Ops Topics", page 38 of the June 1970 issue, read TO 1-1-4. Camouflaged aircraft do NOT carry the "U.S. AIR FORCE" marking on the side, the "USAF" on the wings, or the full-sized national markings (Star and Bar) on the wings or fuselage, as shown in the drawing of the F-4.

As a plastic scale model builder, I try to make my aircraft as accurate as possible and have found that the aircrews, maintenance technicians and wing/squadron commanders will go out of their way to help you with a model of "their" bird.

Thank you for your time and keep up the excellent work on the magazine.

SSgt George F. Rumple, Jr
APO San Francisco 96326

Okay, eagle-eye, you got us! And I think you're the only one that caught it. At least, yours is the first letter. The extraneous markings on the F-4 just slipped by us. We tried to think of some way to sneak out of it—saying that the shading on the fuselage wasn't camouflage paint, just reflections of the clouds or something. But let's face it, we goofed.

It's good to know that our readers take that kind of interest in AEROSPACE SAFETY. It makes each month-long panic worthwhile. So thanks very much for writing. And yes, we'll have a short session on aircraft markings with the art guy

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UNITED STATES AIR FORCE

WELL DONE AWARD

Presented for outstanding airmanship and professional performance during a hazardous situation and for a significant contribution to the United States Air Force Accident Prevention Program.



MAJOR HARRY E. MILLER

964th AEW&C Squadron
McClellan AFB, California

Major Miller and crew were flying from Perrin AFB, Texas, to McClellan AFB at 18,000 feet in a C-121G aircraft when Nr 3 propeller ran away from 2500 to 3650 rpm. The aircraft was slowed from 200 to 150 knots but repeated attempts to feather the engine failed and oil was emerging from stacks and cowl flap area.

The crew advised Air Traffic Control of the situation and, with darkness setting in, thunderstorms and mountainous terrain in the area, they were assigned 12,000 feet and flight routing to Luke AFB, Arizona.

Oil quantity and pressure dropped to zero and seizure procedures were initiated. Nr 4 engine was feathered to avoid losing a second engine when seizure occurred. As engine Nr 4 shut down, the remaining two generators failed resulting in a loss of DC power.

The electrical load was reduced and generator Nr 1 was reset. Generator Nr 2 would not reset. The aircraft descended to 10,500 feet, and Major Miller elected to restart Nr 4 engine in order to regain some altitude and an additional generator. As Nr 4 started, engine Nr 3 seized in the full low pitch position creating maximum propeller drag.

As the flight engineer was advancing Nr 4 throttle, the throttle cable broke between the pilot's and engineer's positions and the manifold pressure stuck at 44 inches. The engineer's throttle would advance only and 600 rpm, the maximum continuous rpm permitted by the Dash One, had to be maintained on engine Nr 4 for the remainder of the flight to prevent overboosting. Electrical power reduction was continued, and Nr 4 generator was reset.

Major Miller's concern then developed for a previously discovered oil leak in the Nr 1 propeller governor housing. The flight continued via low altitude airways and on short final, Nr 4 was feathered to maintain directional control after landing. The brake selector was placed to emergency and the emergency hydraulic cross-over was used to supply nosewheel steering.

Engine Nr 3 analysis revealed failure of the propeller governor pilot valve bearing followed by breakage of the speeder spring in flyweight assembly. This caused maximum oil pressure to be directed to the low pitch stop causing runaway and the inability to feather. High rpm on engine Nr 3 caused internal failure followed by complete loss of engine oil.

Major Miller's crew which included 1st Lt Bob E. Murphy, copilot; 1st Lt Paul G. Foster, copilot; MSgt Roger W. Hurdle, First Engineer; and SSgt John A. Munk, Second Engineer, exhibited outstanding skill and judgment in an emergency which could have resulted in the loss of life and an expensive aircraft. WELL DONE! ★



BIRD SEASON IS THE REASON...

VISOR DOWN

UG9.1305
AFLYS

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Aerospace SAFETY



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UNITED STATES AIR FORCE

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FOR AIRCREWS, MAINTENANCE & SUPPORT TECHNICIANS

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DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

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OCTOBER 1970 AFRP 127-2 VOLUME 26 NUMBER 10



26(10)

Maj Jerry Gentry
and Mr Bert Rutan
AFFTC, Edwards AFB, CA

UNLOAD FOR CONTROL

You F-4 jocks may be wondering just why the "Out-of-Control" procedures were radically modified by a recent Safety Supplement (1F-4C-1SS-113 and 1F-4-(R)C-1SS-84). This article will explain the reasons for the change and hopefully bridge the gap between the current procedures and the new sections III and VI of the F-4 Flight Manual to be published soon.

A stall/spin prevention program was recently flown at Edwards AFB. The basic objectives of the program were to determine the out-of-control characteristics of the F-4 at representative external store loadings and center of gravity (CG) positions. All previous deep stall and spin tests had been accomplished without external stores and at mid- to forward CGs. The specific areas we investigated were stall/departure warning, departure susceptibility and prevention, spin susceptibility and prevention, and spin recovery techniques.

Our test aircraft was an F-4E modified for spin testing. In addition to the standard test instrumentation, the aircraft was equipped with a 33 foot diameter anti-spin parachute which could be mortar deployed 110 feet behind the aircraft. This chute was to give us a recovery capability if we entered a flat spin.

Programs such as this run more than the average risk, so in addition to a modified aircraft we had certain ground rules to follow during the tests. Probably the most interesting and important was that the aircraft would never be intentionally spun. Pro-spin controls would not be applied and held for several turns as in previous tests. All stalls would be entered from conditions that could be experienced in operational use.

Before pressing on with the results of the program, let's clarify

some terms that will be used frequently throughout the discussion.

Wing Rock: Uncommanded roll-yaw motions, viewed primarily as roll oscillations. These oscillations may vary in intensity from small perturbations that degrade precision tracking to objectionably large roll-yaw motions.

Nose Slice: Uncommanded roll-yaw motions viewed primarily as an excursion in yaw. At high AOA, the yaw motions may oscillate, but can diverge, resulting in a departure from controlled flight.

Departure: The first aircraft motions immediately following complete loss of control by the pilot. For the F-4, departure is primarily characterized by a rapid nose slice or yaw.

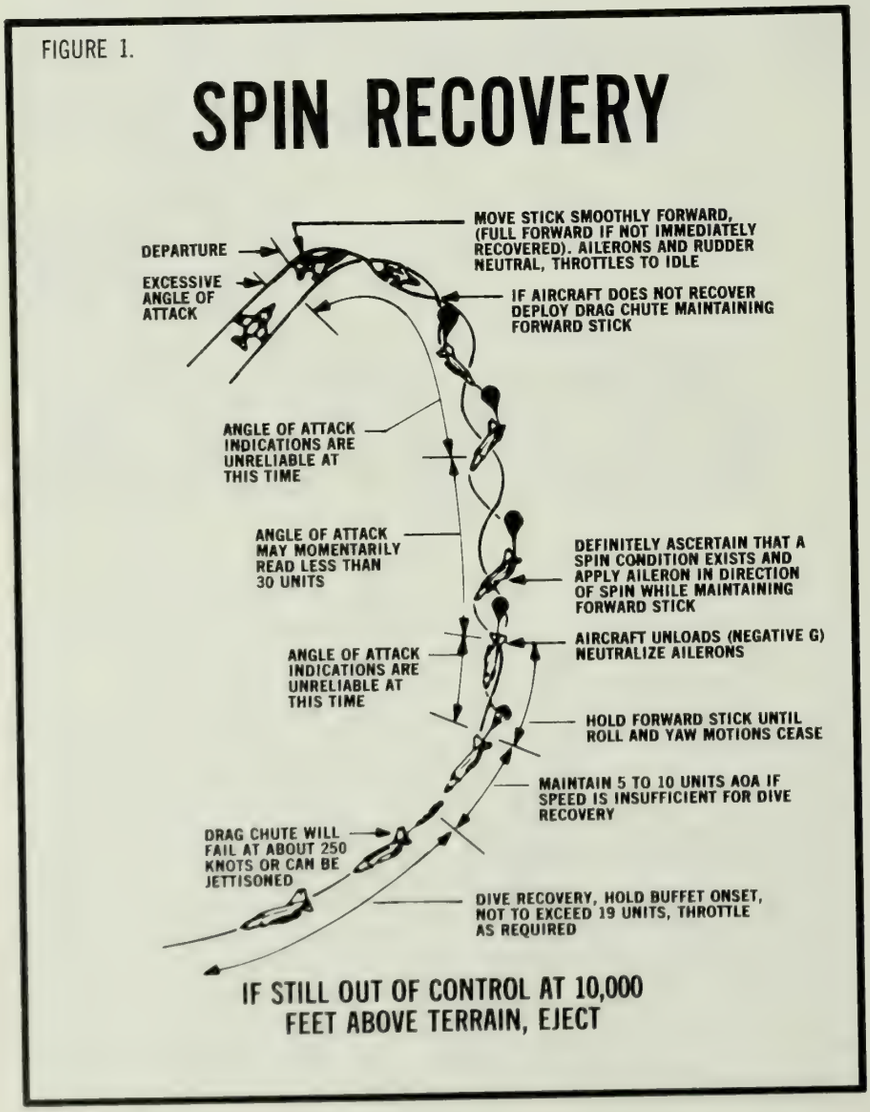
Post-Stall Gyrations: Uncontrollable motions about one or more aircraft axes following a departure. This is usually a rapid roll after an initial yaw divergence and is referred to as a *rolling departure.* However, following departures at very low air speeds (high pitch attitudes), post-stall gyrations may be characterized by random motions about all axes.

Spin: A sustained yaw rotation at AOAs above stall (above 30 units for an erect spin, less than zero units for an inverted spin).

Recovery Rolls: Uncommanded rolling motions below stall AOA that may occur during the initial phase of recovery from a rolling departure or spin. Recovery rolls seldom progress past two rolls.

A wide variety of external store loadings were tested. Stability Indexes up to 180 and asymmetric configurations up to one full 370 gallon external tank were evaluated. The aircraft was departed from controlled flight 233 times, resulting in 132 rolling departures and 101 spins. A discussion of the significant tests is given below.

FIGURE 1.



HIGH AOA MANEUVERING
(Above 15 units AOA)

Approximately 19-20 units AOA is optimum for maximum performance maneuvering. Generally light to moderate buffet and a mild nose rise tendency are evident at these AOAs. Aileron inputs alone do not provide satisfactory roll control and result in adverse yaw and inadvertent AOA increases. The rudder provides reasonably good roll performance up to 20 units. At higher AOAs, rudder roll performance decreases, roll hesitations are experienced, and inadvertent AOA increases result.

LOSS-OF-CONTROL WARNING AT LOW SPEED
(Below 0.8 Mach)

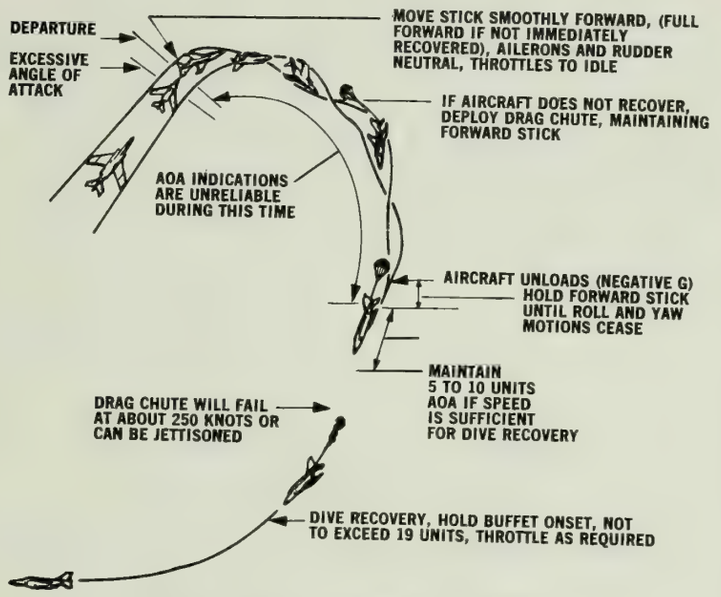
The clean aircraft generally has good low speed warning. Low frequency wing rock occurs near 24-25 units AOA and normally increases in amplitude as AOA is increased. Wing rock is not always a reliable warning since it can cease entirely as AOA increases, and departure can occur without being preceded by wing rock. Buffet intensity may not increase as AOA is increased above 15 units and is seldom considered heavy buffet at departure. The clean airplane generally will not depart below 28 units AOA even with aileron inputs. Aileron inputs at high AOAs often drive AOA even higher and this *will* result in a departure with any store loading.

As external stores are added, loss-of-control warning decreases. Buffet levels are about the same; however, wing rock is less prevalent and is reduced in intensity. Nose slice is a consistent warning, but may occur so close to departure that loss of control may not be prevented. If the aircraft has an asymmetric store loading, loss of control warning is further reduced and becomes essentially non-existent with large asymmetries such as one full 370 gallon tank. Wing rock is seldom experienced and departure will immediately follow the first indication of nose slice.

In all configurations, natural stall warning is negated during abrupt maneuvering, and the rudder pedal shaker is generally masked by aircraft and/or store buffet. Easing the stick forward will always reduce AOA if it is accomplished prior to departure.

FIGURE 2.

OUT-OF-CONTROL RECOVERY



IF STILL OUT OF CONTROL AT 10,000 FEET ABOVE TERRAIN, EJECT

LOSS-OF-CONTROL WARNING AT HIGH SPEED (Above 0.8 Mach)

At these speeds departure will occur at a lower AOA and the AOA interval between warning and departure is less than at lower speeds. Natural stall warning during smooth and moderately abrupt maneuvering is better than at low speeds and consists of light to moderate buffet followed by high frequency wing rock. When maneuvering at high Gs from supersonic to subsonic speeds, the F-4 will "dig in" or pitch-up rapidly and it is relatively easy to "over G" or lose control. Abrupt maneuvering at high AOAs will negate natural warning and probably result in a departure.

OUT-OF-CONTROL CHARACTERISTICS

Rolling Departures, the most prevalent out-of-control event, are distinguishable from spins by their brevity and/or by their lack of a sustained yawing motion. Rolling is the most noticeable uncontrolled motion. If a forward stick recovery is initiated at the first indication of an out-of-control situation, most rolling departures will be limited to only one roll; we never saw more than three rolls even with a delayed recovery. The stick should be moved all the way forward if the rolls continue. There is no reason to "jam" the stick forward—the best technique is to obtain full forward stick travel (if required) within two seconds. Deploying the drag chute with the stick forward will effect a more rapid recovery. There is little chance of deploying the drag chute at too high a speed. Airspeed bleeds off very fast following a departure and will be well under chute limit speed by the time the chute is deployed.

Many factors determine whether the post-stall event will be a rolling departure or a spin. The store loading, CG position, entry attitude, airspeed and AOA rate are the predominant variables. The clean aircraft with a forward CG at low speeds heavily favors a rolling departure. Spin susceptibility following a departure increases at more aft CGs, high speeds and with nose low entries. As external stores are symmetrically added, the F-4 becomes somewhat more spin resistant; however, the loss-of-control warning decreases, and the aircraft will depart at a lower AOA.

A spin is almost inevitable following a departure with a moderate to high asymmetrical loading; however, immediate forward stick at initial nose slice may limit the out-of-control event to a rolling departure. In every case, the aircraft will depart in the direction away from the heavy wing.

Spins generally occur immediately after departure. A rolling departure will not enter a spin if forward stick is maintained until the oscillations cease. Recovery from all spins, except the flat spin mode, can be effected by placing the stick full forward (with neutral ailerons and

rudder) or by a combination of full forward stick and either the drag chute or full aileron in the spin direction. Using forward stick for recovery almost completely eliminates the possibility of a spin reversal (changing spin direction) and the timing involved in detecting recovery is not critical.

The best way to determine if you are in a spin is an excessive and continuous yaw rate. The nose will sweep around the horizon or across the terrain, and yaw will be more noticeable than roll. The turn needle will also be pegged in the direction of the spin. Roll rates can be quite high in spins, but if so, are generally oscillatory, i.e., the roll will hesitate once or twice per spin turn.

Stall entries at high pitch attitudes (40 to 90 degrees) and low speeds (less than 100 knots) are very spin resistant if the controls are neutralized. The nose of the aircraft will fall through the horizon, "flop around," and eventually recover in a nose low attitude. Abrupt stalls in the clean aircraft at transonic speeds will generally result in spins especially at aft CGs. The F-4 with inboard pylons installed is more spin resistant and will recover from spins more quickly than the basic clean airplane. The F-4 with a high symmetrical Stability Index is comparatively spin resistant; most departures result in a rolling departure of two rolls or less.

The spin characteristics vary considerably with different aircraft store loadings; however, the recovery procedures remain the same. The clean aircraft usually spins comparatively steep (pitch attitude averages 45 degrees nose down). The spin may or may not be oscillatory. If it is oscillatory, the spin will appear to "hesitate" in roll and yaw. These hesitations should not be mistaken for impending recovery. Forward stick and the drag chute will unload the aircraft and effect spin recovery. Aileron applied in the direction of the spin will effect a more rapid recovery and could be required if the drag chute should malfunction.

Spins with symmetrical external stores can be recovered with forward stick only. The drag chute and the aileron are less effective as these configurations spin at higher AOAs (less nose down pitch attitude).

Spins with asymmetric loadings are very oscillatory. Full forward stick will effect recovery; however, the spin may continue for six or seven turns. The aileron and drag chute are ineffective for recovery; however, the drag chute will always be effective in reducing residual oscillation after the aircraft unloads.

Aerodynamic recovery of a flat spin in the F-4 is impossible. The probability of a flat spin entry is low and can be further minimized by prompt application of forward stick at departure. The flat mode develops shortly after departure and it is highly unlikely that a spin will progress into the flat mode if proper recovery controls are applied. The

PREVIOUS AND RECOMMENDED OUT-OF-CONTROL AND SPIN RECOVERY PROCEDURES

PREVIOUS PROCEDURES

OUT-OF-CONTROL

1. STICK—5-10 UNITS AOA
2. AILERONS/RUDDER—NEUTRAL
3. IF UNABLE TO OBTAIN 5-10 UNITS AOA RELEASE CONTROLS AND DEPLOY DRAG CHUTE

UPRIGHT SPIN

1. STICK—FULL AFT
2. RUDDER—FULL OPPOSITE TURN NEEDLE
3. AILERONS—FULL WITH TURN NEEDLE
4. YAW STOPPED—AILERONS AND RUDDER RAPIDLY NEUTRAL, AOA 5-10 UNITS
5. IF STILL OUT OF CONTROL BY 10,000 FEET AGL—EJECT

INVERTED SPIN

1. STICK—NEUTRAL
2. RUDDER—FULL OPPOSITE TURN NEEDLE
3. AILERONS—NEUTRAL
4. YAW STOPPED—RUDDER NEUTRAL, AOA 5-10 UNITS

RECOMMENDED PROCEDURES

OUT-OF-CONTROL

1. STICK FORWARD
2. AILERONS/RUDDER NEUTRAL
3. IF NOT RECOVERED MAINTAIN FULL FORWARD STICK AND DEPLOY DRAG CHUTE
4. THROTTLES—IDLE (UNLESS AT LOW ALTITUDE)

UPRIGHT SPIN

1. STICK—MAINTAIN FULL FORWARD
2. AILERON—FULL WITH SPIN (TURN NEEDLE)
3. AIRCRAFT UNLOADED—AILERONS NEUTRAL
4. IF OUT OF CONTROL AT 10,000 FEET AGL—EJECT

INVERTED SPIN

FOLLOW OUT OF CONTROL PROCEDURES

flat spin can be readily identified. It is quite smooth; the yaw rate is very high with no hesitations; there are few, if any, oscillations; the pitch attitude will be about 10 degrees nose low; and the pilot will be forced slightly forward in the seat.

Recognition of an inverted spin is almost as difficult as it is to enter one. The Out-of-Control procedure will effect a rapid recovery.

One of the more interesting findings of this program was that the F-4 will depart and spin without any aileron or rudder inputs. This is due to directional instability above 25 units AOA. Aileron inputs may determine the departure direction (left departure with right aileron); but the susceptibility to depart is not significantly increased by aileron inputs if AOA does not increase. If AOA is not monitored and controlled closely, an aileron input will increase AOA; this *will* cause a departure if AOA is excessive. Control surface mis-rigging, Stab Aug malfunctions and out-of-trim conditions have no significant effect on departure/spin susceptibility.

The external stores should be retained if a spin is entered. Jettisoning stores is not required for spin recovery and will only increase the risk of damage due to probable aircraft-store collision.

The production AOA indications are unreliable from departure until recovery due to errors induced by sideslip and roll and yaw rates. The AOA indicator will generally be pegged at 30 units during upright spins but may momentarily indicate much less due to the errors mentioned above. No attempt to fly AOA should be made until the aircraft is unloaded and all roll and yaw motions cease.

As forward stick or forward stick and aileron start to recover the aircraft, the magnitude of the oscillations will increase. The most violent oscillations and most uncomfortable portion of the spin will generally occur as the aircraft unloads (zero to negative G) during recovery. This unloading using forward stick is the best means of reducing these oscillations and is a positive indication that recovery is imminent. Forward stick should be maintained until all roll and yaw oscillations cease. As the aircraft recovers and starts accelerating, it may enter a series of *recovery rolls*. AOA will normally indicate 10-20 units, speed will be increasing, and the rolls will cease within two or three rolls with full forward stick.

Once these oscillations have stopped, normal throttle and control use will be effective for regaining the desired flight attitude. Do not exceed onset buffet or 19 units AOA maximum if at low altitude during the dive recovery. It is normally not necessary to jettison the drag chute since it will fail and streamline behind the aircraft as speed builds up.

If the engines are at high power settings, a flameout of one or both engines is probable at or just after departure. At initial indication of loss-of-control, the throttles should be retarded to idle if altitude conditions permit. This will normally prevent engine stalls or flamouts, and retain hydraulic and electrical power during the post-stall-gyration or spin. Should a flameout occur, a relight can be obtained with the throttles at idle even during a spin.

Jerry Gentry and Burt Rutan are now making the rounds of all F-4 units to explain and discuss their findings from the stall/spin program.

Make a point of catching their presentation; this is your opportunity to clear up any questions you have about Phantom handling characteristics.

SUMMARY

A comparison of the previous and recommended Out-of-Control and Spin Recovery procedures is shown on page 4. The emphasis now is on "unloading" the aircraft rather than obtaining "5-10 units." This, of course, is because of the AOA indicator errors mentioned above and because unloading will insure a positive recovery. The Upright Spin procedure is merely an extension of the Out-of-Control procedure. In all probability, the Out-of-Control procedures will recover the aircraft from most spins. The new procedures are pictorially presented in Figures 1 and 2.

Many F-4s have been destroyed and good pilots killed due to loss-of-control at low altitudes. The only way to prevent this is to avoid excessive AOAs and we all know that this is easier said than done. A pilot who is aware of and heeds all the warnings available has the best chance of avoiding loss-of-control and safely flying the F-4 to maximum performance. ★

a poor man's VASI approach to a

JUNGLE AIRCRAFT CARRIER LANDING

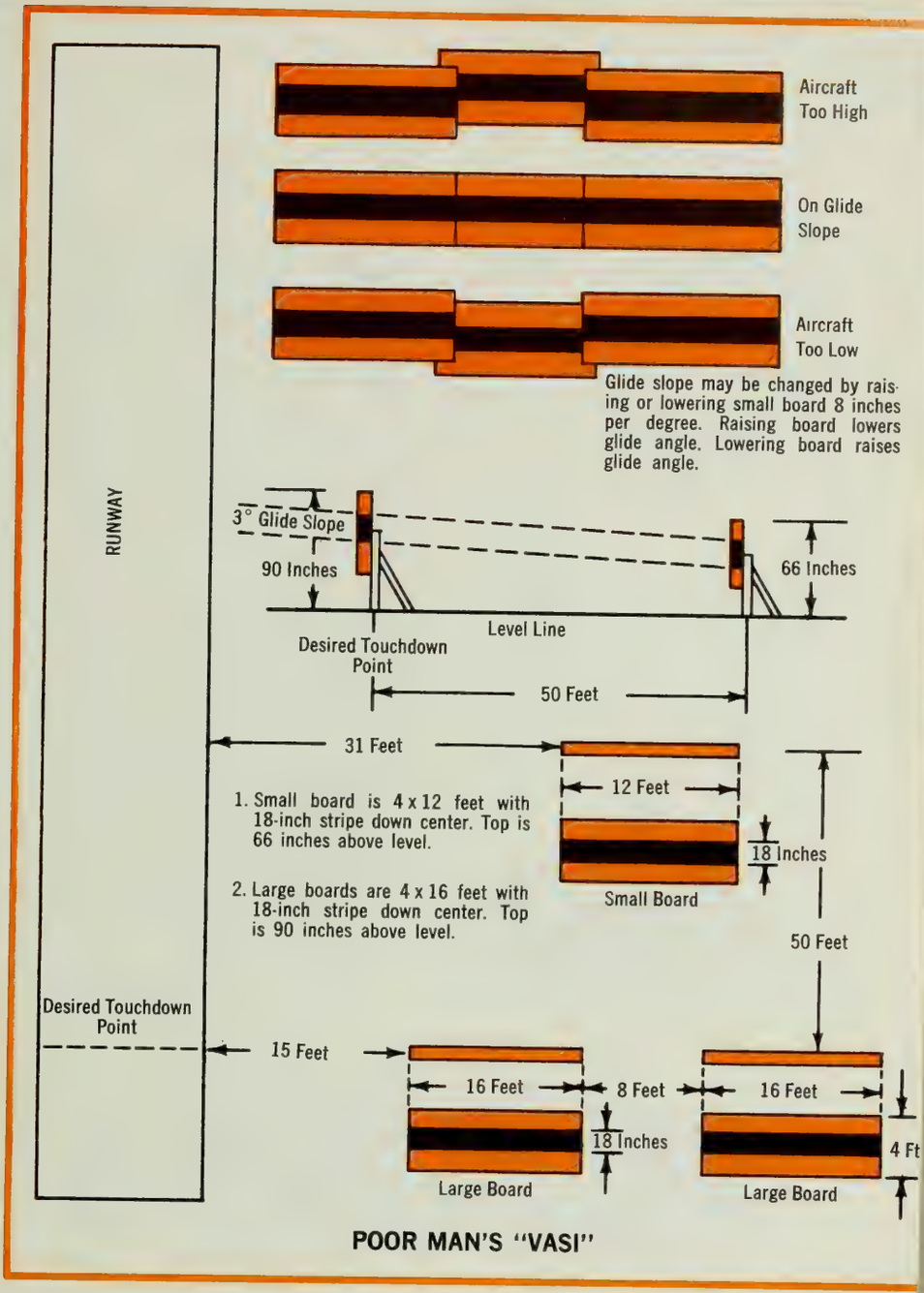




Early this year *Aerospace Safety* carried two articles that have generated quite a bit of mail. These were "Landing Short," February, and "Perspective" in March. Both mentioned a visual landing aid known as the Poor Man's VASI. We didn't anticipate the number of requests we have received for more information about this device or we would have published the details. But since so many have asked, we called on Col Robert Erbe of this headquarters to do this article with drawings and info about the device he installed in Vietnam. Also, for those who desire a copy, we have available a few repros of plans for a similar aid used by the Navy. Just send us a note requesting the POMOLA blueprints.

In this day of two- and even three-mile runways, sophisticated electronic guidance and lighting aids, not to mention continuous communications, some of us find ourselves landing under much more

Col Robert F. Erbe
Directorate of Aerospace Safety



POOR MAN'S "VASI"

primitive circumstances. Like short dirt runways, no lights, no communications, no glideslope. In other words, nothing except the pilot's eyeballs, judgment and skill. Sometimes these are not enough.

The reproduction of a page from the Tactical Aerodrome Directory for South Vietnam illustrates what we mean by an austere airfield. The photograph of the approach to this field gives a better idea of what the pilot sees on final approach.

At Gia Nghia pilots face an unusual set of circumstances. The field is simply a 2000 foot long strip that was built by carving off the top of a hill. There are steep drop offs at each end of the runway with severe downdrafts and strong wind shear. These, plus false illusions induced by the topography and a steep assault approach, present the pilot with a difficult situation. Add poor pilot technique and we have the situation that existed during two landing short accidents—a heavy airplane, behind the power curve, below runway elevation just short of touchdown. IMPACT Angle 80°!

To give our pilots some sort of visual landing aid we borrowed an old device from the Navy known as the Poor Man's VASI. We built it at Phan Rang out of used plywood and installed it at Gia Nghia in March of 1968. If Charlie hasn't carted it away, C-123s, C-7s, O-1s and O-2s may still be using it as an excellent glideslope visual aid. We thought it was just as good as a lighted VASI at one-half to one mile out.

Flying this VASI with proper power control and glideslope flying techniques will always place the aircraft in the slot for a normal flare and landing. A side advantage for forward bases is that the two front panels mark the touchdown point.

Securing large pieces of plywood in forward areas is another problem that you will have to deal with yourself. ★

the numbers game

You just can't get away from it! Everybody lives by the numbers. The clock goes off in the A.M. because we set the alarm on a number. "Gimme a couple of eggs" is the next step. Maybe the ol' buggy needs some gas on the way to work and we make change with numbers. If you think numbers aren't important, try forgetting your anniversary or your wife's birthday.

Whether we like it or not, the mathematicians have got us. But even though we "live by the numbers," they are sometimes elusive little digits that slip insidiously through our fingers. Remember the new guy you met at the bar who was so friendly? "Say, why don't you follow me home and meet my gang—and if you get lost, it's 3742 Elm." Naturally you lose him at the first stop light. No sweat—all you have to do is navigate to 7432 Elm—or was it 3274? After a short 10 seconds of playing the numbers game, you're not even sure you remember the name of the street. Some kind of tree or bush—so we end up with some grouch at 4732 Maple Street telling you, No, he hasn't the foggiest idea where Charlie Brown lives. Fortunately, telephones are fairly available these days, and you get Charlie to reconfirm his address as - - - - (assuming he was one of those who gave you his last name and not his seven digit phone number.) By the way, without looking back, what was Charlie's address?

HOW ABOUT THAT DATE with your wife or sweetie—"See you at _____," and if she's been ready for an hour, Buddy, you're wrong. Or even worse, the boss says, "Wheels in the well at _____." Again it doesn't matter who was misunderstood. He's right and you lose again!

Some of us who fly airplanes for a living are blessed with a super memory for numbers and, maybe equally important, names. However, some of us are real lucky the airplane manufacturer was clever

enough to stamp the bird's tail number on the instrument panel. If you have never pressed the mike button only to release it and frantically search for the stenciled tail number *somewhere* on the panel—you haven't been around too long. On a tactical mission did you ever sit tight while airborne and hope somebody would use your tactical call sign so your mental computer could get back on the track and remind you what your flight call sign was?

MAYBE YOU THINK we're a bit far out with some of these examples but we don't think so. Yours truly has to admit he has drawn at least one of these little mental blanks from time to time.

So far no real harm has been done. Maybe some embarrassed pilot but not much else. But let's complicate this numbers game a bit. How about a real life story.

"Roger AF 61200, I have radar contact. 200 turn left to 240, descend to 4500, squawk 3-2100, (slight pause), weather at Podunk measured 3200 broken, estimated 4800 overcast, viz seven miles, smoke and haze. Wind 200 at 10, altimeter 29.96. Squawk 2200 until passing 240, then 2100. Contact Podunk approach control 289.4 UHF or 125.45 UHF backup, passing 7000 feet."

So far in this short space of maybe one minute you, as a pilot, must be able to accurately sort out in excess of 50 semi-related digits. How many times have you heard this and mentally tried to note the more important bits of information and leave the others for later clarification? Obviously, one of the dangers lies in transposing one or more sets of numbers.

Using the example, how about a descent to 2100 feet on a heading of 320 degrees? Not too critical unless there are some granite buildups in this direction. How about something even less complicated? A pilot had been informed by approach control that the active runway was 02, yet after breaking out at 2500′, he insisted on making a panic approach to 20 to beat a rapidly moving thunderstorm. Since the thunderstorm was small and located over the center of the runway with the landing zone clear, the pilot had no way of knowing another aircraft was landing in the proper direction. Since few runway centerlines are designed to permit two-way traffic, the two aircraft met at about midfield. The result was disastrous. The pilot said, "Roger, I understand," but in his anxiety to get his bird on the ground, the transposition of 02 for 20 just would not register on his mental computer.

THESE ARE JUST A FEW of the problems that confront a pilot in the age of congested air traffic. The only way to stay out of this box is to request the approach controller or tower operator to repeat the instructions. Sure, the R/T clutters the air now, but the repeat to confirm an altitude or heading doesn't take nearly as long as it does to pick up a bunch of broken bones and busted aluminum.

We all know why this string of instructions occurs: The area is filled with pilots who have but one thought in mind—*let's land*. The controller staring into his scope is just as anxious to oblige. However, let's be careful, fellows, and make sure the instructions you "roger" are correct or it may be your "number that's up." ★



THE I.P.I.S. APPROACH

what is your ALTITUDE?



FIGURE 2
COUNTER POINTER (CP)



FIGURE 3
COUNTER-DRUM-POINTER (CDP)



FIGURE 1
THREE POINTER (3P)

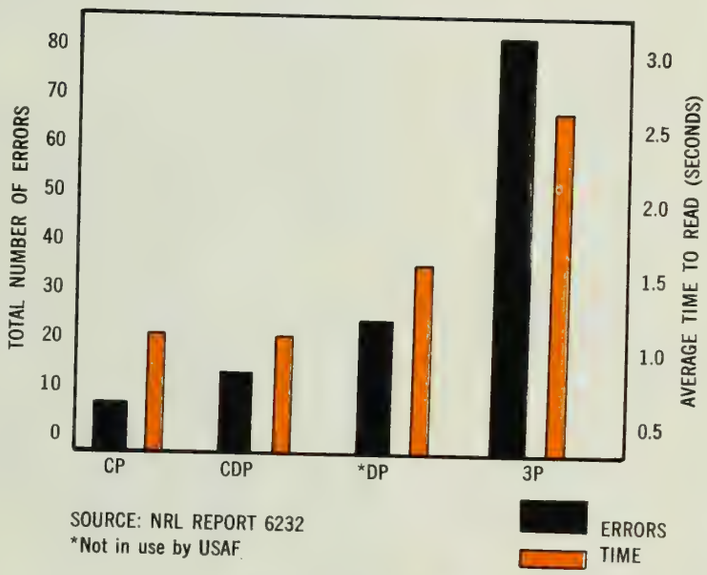


FIGURE 4
ALTITUDE VERTICAL VELOCITY INDICATOR (AVVI)

HOW MANY TIMES have *you* misread your altimeter? Never? Only once? What would have happened if the situation had been slightly different—the weather worse, or perhaps the terrain slightly higher? Try reading the four altimeters on this page and check your answers with those at the end of the article.



THE US NAVY conducted several studies in 1964 and 1965 on misreading of the counter-pointer (CP), counter-drum-pointer (CDP), drum-pointer (DP), and three-pointer (3P) altimeters. Their findings on 1080 trial readings of each altimeter by 18 pilots are depicted on the chart below:



AS YOU CAN SEE, the three-pointer was misread the most; also, it took nearly three times as long to read.

Unfortunately, a recent accident points out the need to reemphasize the proper methods of reading the altimeter. The Air Force presently uses the four types of altimeters shown in Figures 1-4, of which the three-pointer (Fig 1) is the most commonly used. Two variations of the three-pointer (Figures 5 and 6) are shown below:



FIGURE 5



FIGURE 6

THE THREE-POINTER on the right (Fig 6) was designed with the white stripe to make the 10,000′ pointer more noticeable. Both have the low altitude warning symbol which warns the pilot when he is below 16,000′. This symbol as shown in Figures 7-10 is fully in view at 0′, ¾ at 4,000′, ½ at 8,000′, and ¼ at 12,000′.

WHAT IS YOUR

ALTITUDE

CONTINUED



FIGURE 7 (0')



FIGURE 8 (4,000')



FIGURE 9 (8,000')



FIGURE 10 (12,000')



1 READ THE 10,000' POINTER

2 READ THE 1,000' POINTER

3 READ THE 100' POINTER

FIGURE 11

THE MAIN PROBLEM with the three-pointer is the possibility of misreading the altitude by 10,000'. The "1-2-3 Method" will prevent this error. Check the low altitude warning symbol to determine if you are above or below 16,000'; then, proceed as at left.

NO SHORT CUTS ARE ALLOWED. Form the habit of reading the altimeter each and every time, using the "1-2-3 Method." A second problem is that some three-pointer altimeters can be set 10,000 feet in error by rotating the barometric scale. Mechanical stops have been installed on later altimeters to prevent this error. During the instrument cockpit check, always ensure that the 10,000' pointer reads approximately field elevation.

The counter-pointer altimeter (Fig 2) and the counter-drum-pointer altimeter (Fig 3) reduce the probability of misreading. However, they can be misread by 1,000' as the 1,000' counter changes. (This occurs when the 100' pointer is between the 900' and 1,000' position.)

ANS:

Figure 1	12,120′
Figure 2	2,960′
Figure 3	7,960′
Figure 4	40,000′



FIGURE 12

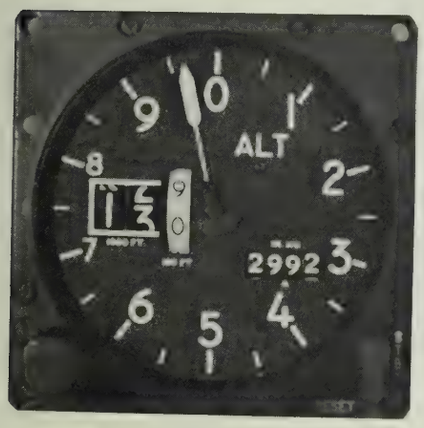


FIGURE 13

TO PRECLUDE misreading the counter-pointer and counter-drum-pointer altimeters read the counters first, then the 100′ pointer. For example, in Fig 12 the counters show an altitude between 14,000′ and 15,000′; the 100′ pointer further defines the altitude as 14,960′. In fig 13 the counters show an altitude between 12,000′ and 13,000′; the 100′ drum and pointer further defines the altitude as 12,960′.

Altitude Vertical Velocity Indicators (AVVI) (Figures 14 and 15) are the least likely altimeters to be misread. At present there are no known problems of misreading these altimeters.

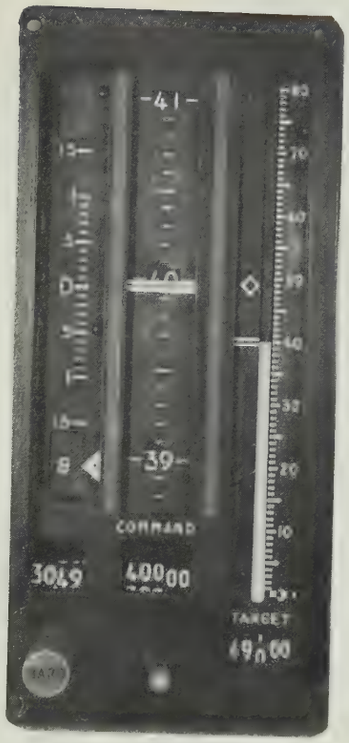


FIGURE 14



FIGURE 15



REMEMBER—regardless of which altimeter you use, one of the best methods to avoid misreading the altimeter is a conscientious effort to increase your instrument proficiency. In other words—GET AS MUCH INSTRUMENT TRAINING AS POSSIBLE!! ★

PLEASE NO SECRETS IN SERVICING

CMSGT LLOYD THOMPSON



Several years ago during the Korean conflict, I was a C-54 crew chief. One day we were preparing my pride and joy for an air evac mission and were running late. I will never forget what happened because we accepted unauthorized assistance as a means to expedite things and make the scheduled departure time.

We parked the bird in front of Base Ops and called for fuel and oil. While we were waiting the navigator proceeded with his preflight and found something wrong with one of the black boxes. A radio man was dispatched to check the Nav's problem; however, when he arrived, we were in the process of servicing fuel. Since there was no power on the aircraft, this energetic radio man offered to service the engie oil while he waited. We welcomed his assistance and everything went well *until*

Servicing completed, I attempted to put power back on the aircraft, but the APU wouldn't start. In trying to determine why it wouldn't start, I found the spark plug covered with oil and the carburetor, fuel pump and fuel line were full of oil. Since the fuel for the APU comes out of Nr 3 main fuel tank, I opened the Nr 3 sump drain and a solid stream of oil came out of the sump!

I'm sure you can guess what had happened. The radio man, in his eagerness to help, had serviced approximately 30 gallons of oil into the Nr 3 main fuel tank. Discovering his own mistake, he decided to say nothing about it.

We drained and flushed the tank and lines and everything was okay. When I think of what could have happened: for instance, had he put the oil in a tank other than the one the APU fuel came from—well, I'm just thankful no one was hurt!

Of course, this sort of thing could never happen in today's modern Air Force, or could it? How about mechs putting engine oil into the hydraulic reservoir. You say it can't be? But it has happened. On the J71 engine, there is a separate integral hydraulic system on each engine for operating the exhaust nozzle actuators. On several occasions engine oil has been discovered in the hydraulic reservoir.

It's not possible to mention servicing problems without touching on the big problem that has been with us since the advent of jet fuels. The problem, of course, is putting jet fuel in an avgas tank. To do this, as the saying goes, is how they make angels.

The new AFM 127-101, para 8-3, provides more stringent rules for personnel handling aircraft fuels. For example, the individual requesting fuel from POL should indicate the type of fuel and the type of aircraft it's for. Also, the man servicing the aircraft must check to see that the truck actually does contain the type of fuel needed for the aircraft being serviced.

Check the manual and follow your TOs and checklists. Above all, if you do make a mistake, don't keep it to yourself. ★

REX RILEY'S CROSS COUNTRY NOTES

The other night another traveler and I were having dinner in the Club at a midwest air base. When the other fellow found out that I was that guy *Riley* from Aerospace Safety, he began filling me in on all his pet gripes about transient services.

"Ya know, Rex," he said, "there are a lot of similarities in any kind of travel. For one thing, no matter what your mode of travel, the thing is that you are going someplace. And you probably are in a bit of a hurry, at least part of the time. Finally, the major irritant to a traveler, as well as the source of his greatest joy and satisfaction, is people. Strangers you've never seen before can make or break your trip.

"I've often wondered," he continued, "why a person will run a third class restaurant . . . or a filthy, sloppy garage. And have you noticed that a friendly smile and a few encouraging words on the part of the proprietor will make a small town motel as satisfactory as one of those brand new palaces with color tv, two king-sized beds, room service and an Olympic-rated pool?

"Now I mention these things because I just got back from a three-week cross country with my family. So it is all fresh in my mind. Now you are in the business of rating transient services at Air Force bases. Don't you run into the same things?"

The guy was right. Travel is the process of going someplace, whether in an airplane, a car or a canoe. And the traveler requires certain services, whether he's spending the night in North Dakota, having his car (or airplane) fixed in Texas, or eating in California. Travel is exhilarating but it is also tiring and the people providing the service ought to realize this.

Awhile back I ran a little experiment. It wasn't very scientific but I think I found out a few things. During a trip that required stops at several bases, including three RONs, I tried being friendly and jovial at one place, then sour and irritable at the next. The results were just what you'd expect with one exception.

At one of our better known bases we taxiied in and parked where the man spotted us—which happened to be just about in front of Ops. This was my turn to be grumpy, but there wasn't much I could say about where we were parked. Then before I could open my mouth about fuel, the TA informed me that the truck was on its way and we would be serviced immediately.

This was rather frustrating. Here I was trying to be mean and all I got was first-class service with a smile. So I decided to take it out on the dispatchers. The frown I wore into Ops was calculated to scare the bravest man alive. I didn't say a word for a minute—just stared around the place as though I were inspecting a disaster area.

How the guy did it, I don't know. But the dispatch managed a smile and "Good evening, sir; welcome to _____ Air Base. Anything we can do for you?"

"Uh, yeah . . . gotta pencil?" I managed to get out, surprised by his reaction to my obvious meanness. Well, he got me a pencil, wheels to the Q, and a map showing the location of the BX, base theater, O club, as well as a card listing all the pertinent base phone numbers.

To make a long story a bit shorter, the whole works was like that. Hard as I tried, I just couldn't work up a mad. In fact, when we took off I was feeling pretty darn good about that base and the Air Force as a whole. Tomorrow, I'll be dropping in at your base. How do you suppose I'll feel when I leave? ★



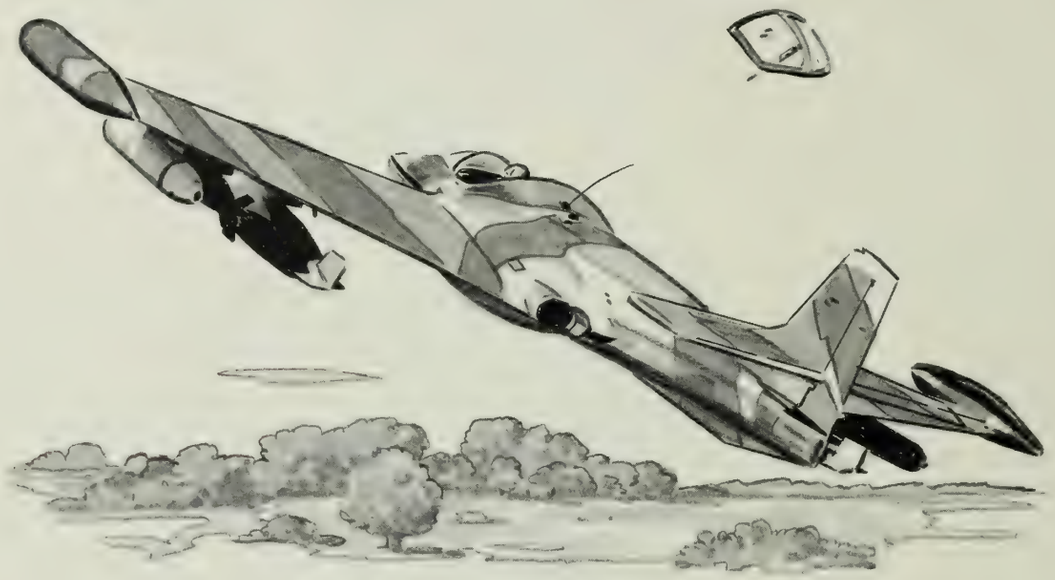
REX RILEY
Transient Services Award

KIRTLAND AFB
ALBUQUERQUE, N.M.

LORING AFB	Limestone, Me.
McCLELLAN AFB	Sacramento, Calif.
MAXWELL AFB	Montgomery, Ala.
HAMILTON AFB	Ignacio, Calif.
SCOTT AFB	Belleville, Ill.
RAMEY AFB	Puerto Rico
McCHORD AFB	Tacoma, Wash.
MYRTLE BEACH AFB	Myrtle Beach, S.C.
EGLIN AFB	Valparaiso, Fla.
FORBES AFB	Topeka, Kans.
MATHER AFB	Sacramento, Calif.
LAJES FIELD	Azores
SHEPPARD AFB	Wichita Falls, Tex.
MARCH AFB	Riverside, Calif.
GRISSOM AFB	Peru, Ind.
PERRIN AFB	Sherman, Tex.
CANNON AFB	Clovis, N.M.
HICKAM AFB	Hawaii
LUKE AFB	Phoenix, Ariz.
RANDOLPH AFB	San Antonio, Tex.
ROBINS AFB	Warner Robins, Ga.
TINKER AFB	Oklahoma City, Okla.
WETHERSFIELD AFB	England
HILL AFB	Ogden, Utah
YOKOTA AB	Japan
SEYMOUR JOHNSON AFB	Goldsboro, N.C.
ENGLAND AFB	Alexandria, La.
MISAWA AB	Japan
KADENA AB	Okinawa
ELMENDORF AFB	Alaska
PETERSON FIELD	Colorado Springs, Colo.
RAMSTEIN AB	Germany
SHAW AFB	Sumter. S.C.
LITTLE ROCK AFB	Jacksonville, Ark.
TORREJON AB	Spain
TYNDALL AFB	Panama City, Fla.
OFFUTT AFB	Omaha, Nebr.
ITAZUKE AB	Japan
ANDREWS AFB	Washington, D.C.
McCONNELL AFB	Wichita, Kans.
NORTON AFB	San Bernardino, Calif.
BARKSDALE AFB	Shreveport, La.
HOMESTEAD AFB	Homestead, Fla.
CHANUTE AFB	Rantoul, Ill.

Tech topics

BRIEFS FOR MAINTENANCE TECHS



DOWN TIME

Have you ever been driving on a black night on a dark road and suddenly have your lights go out! Wow! The experience is terrifying.

With that thought in mind, read what happened to an A-37 pilot. While pulling up from a strafing pass, his seat went *kerpow,* all the way to the bottom. After recovering from the surprise, the pilot installed the pins and readjusted the seat. On the second pass the seat bottomed abruptly in exactly the same place as on the first pass, only this time the canopy blew off at the same time. The pilot declared an emergency and made an uneventful straight-in approach and landing. Investigation revealed the vertical arm adjust lock was not properly locked due to the seat adjustment cable being improperly adjusted. This caused the seat to bottom out under G loads.

Can you imagine what might have happened had the seat bottomed during a critical phase of landing? So how about you maintenance types making sure that seat locking mechanisms are in proper working order to prevent the pilot's lights from going out during critical phases of operation. ★

KNOW YOUR SUBS

The '101 pilot on a training flight had leveled off and increased airspeed to 540 knots. Approximately three minutes later the right engine flamed out. Air-starts were attempted in both the normal and emergency systems without success so a single engine landing was made.

Investigation revealed that a substitute seal had been installed in a fuel line during the last inspection. The seal was too small, allowing line separation. Two seals had been issued from base supply under the same part number and apparently one of these seals was of a different thickness than the other.

A word to the wise for all maintenance personnel. Investigate all substitute items and make sure, to the best of your ability, that the item really is a substitute. ★

ye old battery



THE PRIMARY PURPOSE of the aircraft battery, as everyone knows, is to supply emergency power in the event other power sources become inoperative during flight.

Two recent incidents indicate a need to highlight some do's and don'ts pertaining to battery maintenance.

The old standby lead acid battery requires more attention from the crew chief than do the silver zinc and nickel cadmium batteries. The water level of a lead acid battery is checked and serviced when necessary, by the crew chief. **NOTE: if you are in a cold climate be sure the battery receives a sufficient charge directly after servicing so the water will mix with the electrolyte to prevent the water from freezing.**

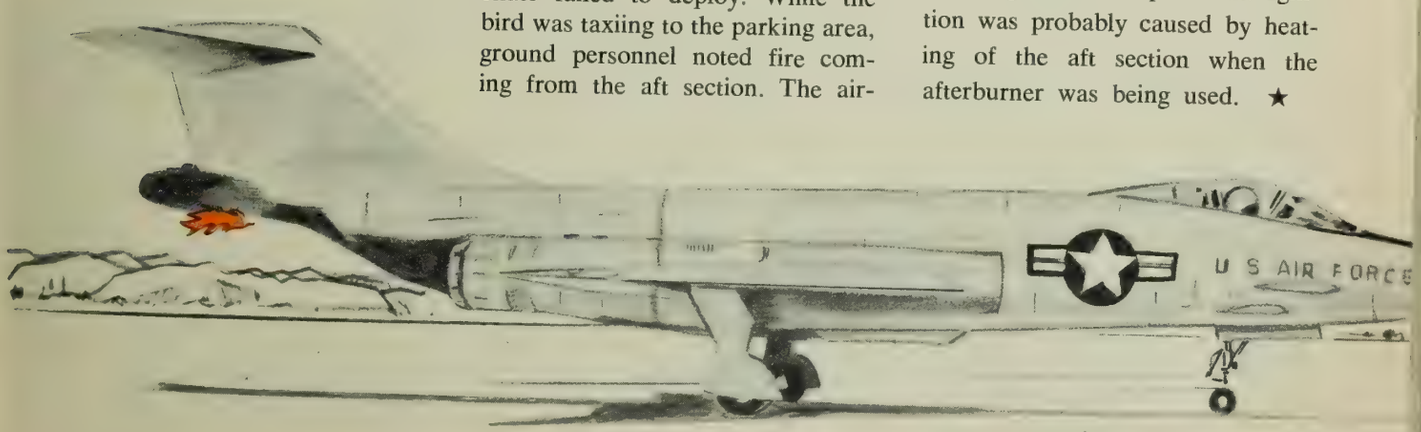
The crew chief must also take specific gravity readings. Here again temperature is important, so be sure you make temp corrections. The temp correction hydrometer has a thermometer which reads the temperature of the electrolyte and shows the correction to be made for various temperatures.

With the exception of water service and hydrometer checks, line maintenance of silver zinc and nicad batteries is about the same. Cleanliness and security of all parts in the battery compartment, along with proper service of the sump jar, is a must.

Remember the battery's primary purpose is for emergency power, so use it only as directed for ground operation. This also applies to flight crews: do not perform the before-engine-start checklist with battery power. For further information on battery maintenance, refer to 8D2 series TOs. ★

FIRE

Due to weather, the '101 pilot decided to land early so he went into afterburner to burn off 2000 lbs of fuel to lighten the aircraft. Everything went as planned until after touchdown when the drag chute failed to deploy. While the bird was taxiing to the parking area, ground personnel noted fire coming from the aft section. The aircraft was spotted and the fire extinguished. This little episode was caused by a loose "B" nut on a fuel vent line which allowed fuel to saturate the heat blanket around the drag chute compartment. Ignition was probably caused by heating of the aft section when the afterburner was being used. ★



Tech topics

CONTINUED

F-100 SOAP SAMPLING

Teardown of an F-100 engine that had been involved in an accident revealed that a glass SOAP sample bottle was in the engine oil tank at the time of the accident. From past experience we know that the standard SOAP sample bottle can lodge in the oil stand pipe and prohibit oil from reaching the engine. Consequently, special attention has been directed toward F-100 SOAP sampling procedures. TO 42B-1-9 gives a WARNING not to handle sample bottles, bottle caps, or tube caps directly over oil tank fillers.

Particular emphasis should be placed on retrieving foreign objects accidentally dropped in oil tanks or any other location on aircraft. Commanders should review their spectrometric oil analysis program to insure that (1) all affected personnel have received SOAP training and have seen the Air Force training film TF 6090, (2) units have written standing operating procedures, and (3) necessary equipment is available. ★

Maj Edward E. Cameron
Directorate of Aerospace Safety

SMOKING C-141

A call over the crash net indicated that smoke was coming from the left wing of a C-141. The maintenance officer, first to arrive on the scene, found everything under control. The stage was set for this little fiasco by the inadvertent actuation of the outboard wing deice switch while maintenance was being performed on the pilot's windshield. After about 20 minutes of APU operation, the loadmaster noted what appeared to be smoke coming from the left wing leading edge. Maintenance investigation revealed no heat damage to the wing.

The windshield maintenance had been performed after the flight crew preflight. However, we wonder what happened to the wing anti-ice valve open light. The apparent smoke was determined to be vapor caused when rain hit the hot leading edge of the wing. ★

TOOL TIP

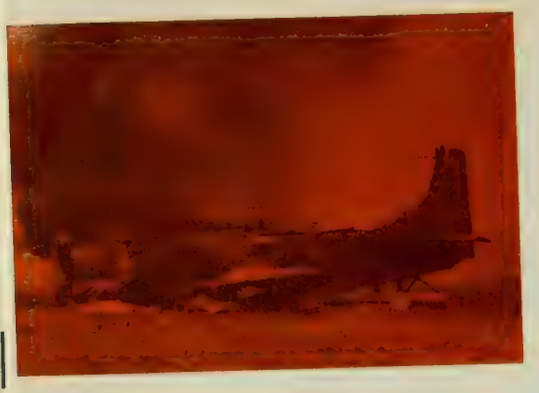
We came across the idea below in General Electric's JET SERVICE NEWS, and we think it's great! "TRY PUTTING A BAND OR TWO OF REFLECTIVE TAPE, THE KIND USED ON AUTOMOBILE BUMPERS AND BICYCLE FENDERS, ON YOUR HAND TOOLS. THEN SHINE A FLASHLIGHT INTO THOSE DARK PLACES WHERE YOU MAY HAVE DROPPED OR PUT A TOOL." ★

KC-135 WRONG COWLING

During cartridge start of Nr 4 engine an explosion caused extensive damage to the cowling assembly. The explosion was the result of an unmodified Nr 3 engine left side panel being installed on the Nr 4 engine. Exhaust gases from the expended starter cartridge were trapped within the cowling. The explosion damaged the cowling beyond repair. This very expensive mistake caused by someone installing the wrong cowling on the wrong engine cost more than $12,000. ★



This is **not** the time to wonder if the cowling is on the right engine or not.



are you prepared to

hit the gro

When you think of an ejection seat, you think about ejection—getting out of a moving airplane in a hurry. Trouble is, there's more to it than that—more than just pulling the handle and floating gently to the ground, away from your no-longer airworthy air machine. Emergency ground egress can be a lot more complex. It can require many more steps—and a better understanding of the system. And it can be just as important to you.

A CRASH LANDING, an aborted takeoff that went sour, or gear collapse after you hydroplane off the side of the runway, and—Fire!! Suddenly you're in a tremendous hurry to get out and away. But the straps, braces, restraints and cords that held you secure and unhurt during the sudden stop are now working contrary to your most urgent desires.

The thought of ground-level ejection flashes momentarily through your mind. You dismiss it. The thing for you now is a fast exit over the side, get two feet on the ground and run!

It's the fast part that gets you. Freeing yourself of all the equipment that is holding you in the cockpit is not the simple one-motion act that ejection is. AT LEAST FORTY AiRCREW MEMBERS, FACED WITH EMERGENCY GROUND EGRESS SITUATIONS DURING 1968 AND 1969, EXPERIENCED DIFFICULTY — AND DELAY. Not all of them made it.

Much of that difficulty and delay came about because the people involved weren't familiar with the correct procedure for emergency ground egress. In case after case, we find that:

- Pilot activated wrong handle.

(emergency gear handle instead of canopy jettison)

(survival kit release instead of secondary escape handle)

- Pilot couldn't locate correct handle.
- Pilot didn't complete all steps of egress procedure.

(got out of parachute harness but left oxygen hose attached to the harness)

(started to stand up and was held back by leg restraints, chute risers, shoulder harness or radio cord).

Separation from the seat survival kit is a very frequent delay-causing problem. In many airplanes, a single handle deploys the kit once you are suspended beneath the chute. You use the same handle to separate from the heavy and cumbersome kit for emergency ground escape. Trouble comes when you start up out of the seat before you actuate this handle. In delaying until your weight is off the kit, you de-



Plunger (arrow) is key to separation from survival kit. If it's extended when you pull secondary escape handle, you remain attached to raft (right).

...und running

John D. Shacklock, Maj, USAF (Ret)

ploy it instead of separating from it. Then you find yourself stopped cold at the end of a nylon cord right after you get your feet on the ground. More than once the crewmember caught at the end of the raft suspension cord has not been freed until the cord burned through!

A breakout of the forty ground egress difficulty cases by type aircraft is a real eye-opener. Sixty-five per cent of them were in the F-4 and A-1! The Phantom accounted for 17 (42.5%) and the Skyraider nine (22.5%). All other aircraft types combined added up to only 14 cases of difficulty (35% of the total). The reason for this distribution is obvious when you look at the systems. The egress systems in the F-4 and A-1 are unique. They're different, and probably more complex, than the rest of our systems. They both have good records of performing their primary function —emergency airborne escape from a disabled aircraft. But because of their complexity, and difference from the systems we were initially trained on, we've had trouble getting out of them in a hurry on the ground.

With both the Martin-Baker ejection system in the F-4 and the Yankee extraction system in the A-1, you wear an integrated torso harness into the airplane. The parachute and survival kit stay with the bird. You are held in the seat by a conventional lap belt and shoulder harness in most aircraft. With these two systems you attach your torso harness at several points to straps on the seat. A secondary escape handle severs these straps for manual bailout, releases you from the seat and leaves the parachute and kit attached to your harness. These can be significantly bulky, troublesome and delay-causing during the hurry of emergency ground escape. Therefore, in both aircraft, you must take additional actions before you can come out of the cockpit the way you entered it—light, unencumbered, with only your helmet and harness attached to you.

And it's in these additional actions that we run into trouble. When you're getting out of the cockpit under normal conditions, you just unfasten the Koch fittings attaching your harness to the straps. But because these are sometimes difficult to operate with gloves on, and to speed up your egress, the systems are designed with a survival kit release handle. Then, in addition, in the F-4 it's recommended that you reach up and release the parachute risers from your harness. Omit a step, or get them out of sequence, and you find yourself tangled up in the equipment. And your rapid escape from the cockpit is further delayed.

If you decide to shorten the procedure and muscle your way out of the cockpit with parachute and survival kit hanging from your harness, you're in for trouble. In the F-4 you must grasp something ahead of you—like the canopy bow —and pull yourself up to break away from the seat even without the weight of the parachute and kit. Try to carry them out of the cockpit with you for the first time, and you find you're carrying a lot more weight. It surprises you—and slows you down.

In the A-1E and G models it is



Parachute and survival kit attached, pilot has difficulty climbing out of A-1E/G seat.

virtually impossible for a large man to get out of the cockpit in a hurry with the rigid parachute frame on his back and the bulky kit hanging under him. It's a gymnastic feat that even most small pilots have great difficulty with.

The major problem in the "all other" category aircraft has occurred when pilots decided to unstrap from their parachutes before

hit the ground running

Many of us don't pay enough attention to getting out of the bird in a hurry WITHOUT using the ejection (or extraction) system.

going over the side. In more than one-third of the cases in which they experienced difficulty and delay, the pilots found themselves hauled back down into the seat by the oxygen hose because they hadn't disconnected it from the parachute harness. The quick-disconnect on the CRU-type connector is on the bottom—it separates from the aircraft supply hose, not from the harness.

The A-1H and J models (perhaps alone among all fighters) are equipped with a two-buckle lap belt. The buckles are really Koch fittings, and not readily adapted to rapid unfastening. You must unfasten both fittings (or your torso harness) because the center portion of the lap belt is threaded through the harness leg straps.

Habit is strong and unpredictable; several A-1H pilots have found themselves struggling to get out of the cockpit after unfastening only one side of the lap belt. One hapless pilot, after aborting takeoff, running off the end, collapsing the gear and bursting into flames, did this. But he got out of the cockpit —and found himself hanging head down beside the fuselage. Completely helpless and already seriously burned, he survived only because several people were able to reach his position and free him in a very short time.



Photo from rescue helicopter shows pilot suspended over the side of A-1H by lap belt.

This was an experienced pilot on his third combat tour. But he was relatively inexperienced in the A-1H. He had attempted to release his restraints by using the secondary escape handle, but couldn't get it to work and decided to unstrap and get out. Apparently he reverted to earlier training in other fighters, unfastened one lap belt fitting and went over the side.

There is only one sure-fire way to overcome this very natural tendency to revert to earlier, well-learned habits or training when you are in a situation of extreme stress. That is to erase the earlier training by abundant and continuing new training in the new habits or disciplines.

Serious attention to the recurring seat simulator training your unit schedules is a must. But it's not enough. You should rehearse your ground emergency escape procedures practically every time you enter the cockpit. Take a few seconds either before or after each flight. Sit in the cockpit, give yourself the command, "Go!", and move your hands through the motions of the escape procedure. Make sure you have it all in the correct sequence. Make sure you can get your hands into the correct positions. Mentally review any areas or steps in the procedure which have proven to be stumbling blocks to others in their escape attempts.

Your training must make the sequence of motions in emergency ground egress an automatic response. Then continuation training must keep it automatic as long as you fly the equipment.

CONSIDER EJECTION

IN SOME CASES, ground level ejection or extraction might have been the best way out of the airplane—fastest, cleanest, safest. Or ejection before the airplane came to a final stop might have been the answer. But there are far too many variables to allow us to set down any hard and fast rules on this one.

If you're riding a seat with zero-zero capability, it's up to you. Think about it, evaluate the history and experience—the success rate, if one has been established—of that particular seat, and make your own rules. Decide for yourself what situations, or what types of situations, will warrant serious consideration of ground-level ejection. Don't arbitrarily dismiss it, and don't attempt it frivolously.

Even under optimum conditions, ground level ejection is an extremely high-risk adventure. Timing and sequencing are down to fractions of seconds. Rocket ignition, seat separation, parachute inflation must occur with no delay.

But consider it.

Someday it may be your only route to survival.

A-1 AIRCRAFT





SURVIVAL KIT RELEASE HANDLE—Pull out. (This will leave the kit in the airplane, freeing the pilot for easier exit).

This handle must be pulled with crewmember's weight on the seat or the survival kit will remain attached to the torso harness.









SECONDARY ESCAPE HANDLE—SQUEEZE AND PULL UP.

This handle must be moved through its full 110-degree arc of travel. Pull force required is 80 pounds. In right seat of A-1E/G there may not be sufficient room to place your hand around the handle. Learn to initially grasp it backhand. In A-1H/J, should handle fail to release you from lap belt and shoulder harness restraints after you insure full 110-degree rotation, you will have to manually unfasten *4* Koch fittings (2 on risers at your shoulders, 2 on lap belt). *A single-fitting lap belt is undergoing test now, but it won't be in the field for several months.*



PERSONAL EQUIPMENT LEADS—DISCONNECT.

Communication cords, oxygen hose.

CONTINUED



A-1E/G—AUXILIARY CANOPY REMOVAL HANDLE—PULL DOWN.

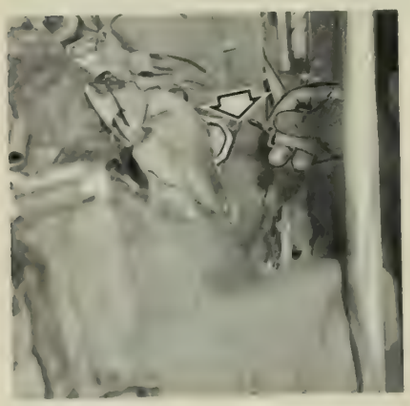
A-1H/J—CANOPY JETTISON SWITCH — JETTISON.

Practice this one in H/J models. It's very difficult to reach. Decide how you'll break plastic guard over switch.

ABANDON AIRPLANE

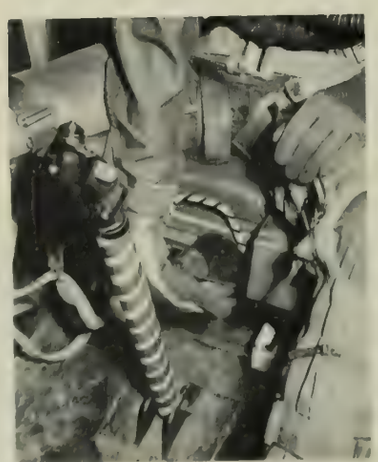
—but before you go:

A-1E/G—if you decided to rid yourself of the weight and bulk of your parachute by releasing the two upper Koch fittings, BE SURE to pull up the button on your D-ring bracket and disengage it from your harness.



A-1H/J—if you snapped your pararaft lanyard to the right side of your harness when you strapped in, BE SURE you unsnap it.

F-4 AIRCRAFT



LOWER EJECTION HANDLE GUARD-UP.



SHOULDER HARNESS—RELEASE.
Leave the parachute in the bird, it can catch on something on your way out.



SURVIVAL KIT RELEASE HANDLE—ROTATE AFT.
Inside handle first, then—



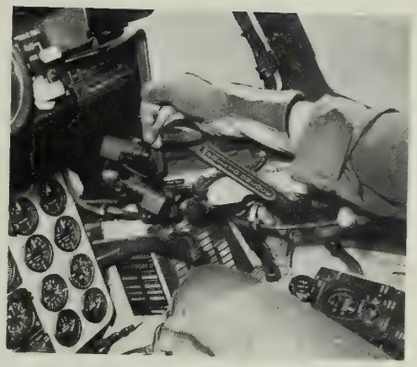
EMERGENCY HARNESS RELEASE HANDLE—LOCK UP.

If you allow the handle to return to the down position, it may re-lock your leg restraints. This has happened too often!

CANOPY—OPEN.



Try the normal canopy open switch first to avoid possibility of inadvertent ejection.



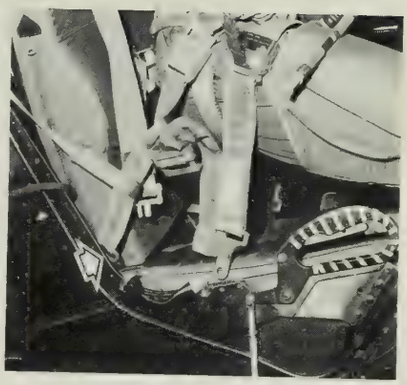
Then the manual canopy unlock handle, but remember you must hold the canopy open—there's no air pressure to hold it up.



Next go to emergency jettison handle on the left.



Finally, if you must, bust out with your canopy breaker tool. Start at a forward corner of the canopy and KEEP HITTING IT IN THE SAME PLACE!! Don't bang away at random all over the place.



With the canopy open (or removed), grasp the windshield bow and pull yourself up. You must use sufficient force to release the sticker clips (arrow) from the seat.

ABANDON AIRPLANE.



Should you find that you are still attached to the survival kit by the raft lanyard, you don't have to wait for it to burn through—or for someone to cut you loose. Just punch the survival kit quick release where it attaches to your harness at your left hip. ★

USAF AERO CLUB DIRECTORY

The information contained in this directory is the latest available. If there are any inaccuracies please forward corrections for your club listing to Aerospace Safety for publication.

Here's the way to read the directory: Base name, hours of operation, fuel (octane), all have oil available, and phone number. Clubs located on base are printed in black, and those located off base are in color with the name of the airport. Happy Landings!

STATE, CLUB & FLYING LOCATION	SERVICE AVAILABLE	PHONE NO.
ALABAMA		
Maxwell-Gunter AFB (AU) Gunter AFB AL 36114	0800-Sunset Gas 80/100 / Oil	279-5141
ALASKA		
Eielson AFB (AAC) Eielson AFB AK	0800-1700 Gas 80 / Oil	377-1223
Elmendorf AFB (AAC) Elmendorf AFB AK	24 Hours Gas 80 / Oil	752-4167
ARKANSAS		
Blytheville AFB (SAC) Blytheville AFB AR 72315	0800-1700 Gas 80/100 / Oil	763-9305
Little Rock AFB (TAC) Little Rock AFB AR 72076	0730-Sunset Gas 80/87 / Oil	988-1234
ARIZONA		
Davis-Monthan AFB (SAC) Davis-Monthan AFB AZ 85707	0800-1700 Gas 80 / Oil	327-7632
Luke AFB (TAC) Phoenix-Litchfield Muni Aprt Phoenix AZ	0800-1700 Gas 80 / Oil	935-4891
CALIFORNIA		
Beale AFB (SAC) Beale AFB CA	0800-1900 Gas 80 / Oil	788-1972
Castle AFB (SAC) Merced Municipal Aprt	0800-Sunset Gas 80/100 / Oil	722-3638
Det 1 AFSCF (AFSC) NAS Moffett Field CA 94035	0900-1500 Gas 80 / Oil	739-4510 Ext 2584
Edwards AFB (AFSC) Edwards AFB CA 93523	0730-1700 Gas 80 / Oil	277-2474
Hamilton AFB (ADC) Hamilton AFB CA 94934	0800-2000 Gas 80 / Oil	838-4447
Los Angeles AFS (AFSC) Los Angeles Intl Airport Los Angeles CA	24 Hours Gas 80 / Oil	643-1882
March AFB (SAC) March AFB CA 92508	0800-1800 Gas 80 / Oil	655-2455
McClellan AFB (AFLC) Sacto-Exec Airport Sacramento CA 95822	0800-Sunset Gas 80 / Oil	428-2812
Norton AFB (MAC) Norton AFB CA 92409	0800-1700 Gas 80/100 / Oil	876-2545
Travis AFB (MAC) Tolinas Air Strip Travis AFB CA 94535	0800-Dark Gas 80 / Oil	(707) 437-3470 (707) 438-3237
Vandenberg AFB (SAC) Vandenberg AFB CA	0900-1800 Gas 80 / Oil	734-5328
COLORADO		
Ent AFB (ADC) Peterson Field Colorado Springs CO	24 Hours Gas 115/145 / Oil	635-8911 Ext 4310
Lowry AFB (ATC) Buckley Field Denver CO	0730-1630 Gas 80 / Oil	553-3660 Ext 508
USAF Academy (USAFA) USAF Academy Air Field Colorado Springs CO 80840	0800-1700 Gas 80/100 / Oil	472-4423
FLORIDA		
Eglin AFB (AFSC) Eglin AFB FL	0730-1630 Gas 80 / Oil	882-5948
MacDill AFB (TAC) MacDill AFB FL 33608	0800-1700 Gas 80/87 / Oil	830-3391
Patrick AFB (AFSC) Patrick AFB FL	0800-1700 Gas 80 / Oil	494-4356
Tyndall AFB (ADC) Tyndall AFB FL 32401	0800-1600 Gas 80 / Oil	283-2636
GEORGIA		
Moody AFB (ATC) Valdosta Municipal Airport Valdosta GA 31601	Daylight Gas 80/100 / Oil	244-1527
Robins AFB (AFLC) Robins AFB GA 31093	0800-1700 Gas 80 / Oil	922-2634
HAWAII		
Hickam-Wheeler AFB (PACAF) Wheeler AFB HI 96515	0730-1900 Gas 80/87 / Oil	656-161

STATE, CLUB & FLYING LOCATION	SERVICE AVAILABLE	PHONE NO.
ILLINOIS		
Chanute AFB (ATC) Chanute AFB IL	0730-1930 Gas 80/100 / Oil	(217) 893-3111 Ext 3384
Scott AFB (MAC) Scott AFB IL	0930-1730 Daily 0800-1700 Weekends Gas 80/100 / Oil	256-4394
INDIANA		
Grissom AFB (SAC) Grissom AFB IN	0800-1700 Gas 80/100 / Oil	689-7258
KANSAS		
Forbes AFB (TAC) Forbes AFB KS 66620	0800-1700 Gas 80 / Oil	865-4517
McConnell AFB (TAC) McConnell AFB KS 67221	Daylight Gas 80 / Oil	685-1151 Ext 5180
LOUISIANA		
Barksdale AFB (SAC) Barksdale AFB LA	0800-1630 Gas 80 / Oil	423-8871
England AFB (TAC) England AFB LA	24 Hours Gas 80 / Oil	(318) 448-5609
MAINE		
Loring AFB (SAC) Loring AFB ME	0730-1630 Gas 80 / Oil	3207
MARYLAND		
Andrews-Bolling AFB (HQ COMD) Hyde Airport Clinton MD 20735	0800-Sunset Gas 80 / Oil	297-9229 297-4618
MASSACHUSETTS		
L. G. Hanscom Field (AFSC) L. G. Hanscom Field MA 01730	24 Hours Gas 80 / Oil	861-5731
Otis AFB (ADC) Otis AFB MA 02542	Daylight Gas 80 / Oil	(617) 563-2215
Westover AFB (SAC) Westover AFB MA 01022	24 Hours Gas 80 / Oil	593-3183
MISSISSIPPI		
Keesler AFB (ATC) Keesler AFB MS	1000-1800 Gas 80 / Oil	3849
MISSOURI		
Whiteman AFB (SAC) Whiteman AFB MO 65301	0800-Sunset Gas 80/100 / Oil	563-3311
NEBRASKA		
Offutt AFB (SAC) Offutt AFB NB	24 Hours Gas 80/100 / Oil	292-1517
NEW JERSEY		
McGuire AFB (MAC) McGuire AFB NJ	0800-1700 Gas 80 / Oil	3113
NEW MEXICO		
Hollomon AFB (AFSC) Midway Airport NM 88310	Daylight Gas 80 / Oil	(505) 437-0490
Kirtland AFB (AFSC) Kirtland AFB NM 87117	Prior Request Gas 80 / Oil	(505) 247-1711 Ext 3486
NEW YORK		
Griffiss AFB (AFLC) Griffiss AFB NY 13440	0800-1800 Gas 80/100 / Oil	(315) 330-3435
NORTH CAROLINA		
Seymour-Johnson AFB (TAC) Seymour-Johnson AFB NC	0730-1730 Gas 80 / Oil	736-1864
OHIO		
Wright-Patterson AFB (AFLC) Wright Field OH	0730-1630 Gas 80/100 / Oil	255-3847
OKLAHOMA		
Tinker AFB (AFLC) Tinker AFB OK	0930-1630 (Except Sun & holidays) Gas 100 / Oil	732-7321 Ext 2467

STATE, CLUB & FLYING LOCATION	SERVICE AVAILABLE	PHONE NO.
Vance AFB (ATC) Vance AFB OK	0700-Sunset Gas 80 / Oil	237-2121 Ext 7223
SOUTH CAROLINA		
Charleston AFB (MAC) Charleston AFB SC 29404	0800-1700 Gas 80 / Oil	747-4111 Ext 3614
Shaw AFB (TAC) Shaw AFB SC	0800-Sunset Gas 80/100 / Oil	436-6123 436-6389
SOUTH DAKOTA		
Ellsworth AFB (SAC) Ellsworth AFB SD	0700-Sunset Gas 100 / Oil	923-1955
TENNESSEE		
Arnold AFS (AFSC) Arnold AFS TN	Daylight Gas 80/100 / Oil	455-2611
TEXAS		
Bergstrom AFB (TAC) Bergstrom AFB TX 78743	0730-Sunset Gas 80 / Oil	385-3586 Ext 2301
Kelly AFB (AFLC) International Airport San Antonio TX 78216	24 Hours Gas 80/100 / Oil	824-2313 Ext 64
Perrin AFB (ADC) Perrin AFB TX 75090	0800-1800 Gas 80 / Oil	2504
Randolph AFB (ATC) Randolph AFB TX 78148	0830-1900 Gas 80 / Oil	(512) 652-4364
Sheppard AFB (ATC) Sheppard AFB TX 76311	0800-1700 Gas 80 / Oil	2160
Webb AFB (ATC) Webb AFB TX 79720	1630-Sunset Daily 0800-Sunset Weekends Gas 80 / Oil	(915)263-1344
UTAH		
Hill AFB (AFLC) Hill AFB UT	0900-1800 Gas 80 / Oil	3566
VIRGINIA		
Langley AFB (TAC) Langley AFB VA	0800-Sunset Gas 80/100 / Oil	764-2743
WASHINGTON		
Fairchild AFB (SAC) Fairchild AFB WA 99011	0800-Sunset Gas 80 / Oil	244-9292
CANAL ZONE		
Albrook AFB (USAFSO) Albrook AFB Canal Zone	24 Hours Gas 80 / Oil	86-7210
PUERTO RICO		
Ramey AFB (SAC) Ramey AFB PR	0730-2200 Gas 100 / Oil	22251 7287
EUROPEAN AREA		
Bentwaters/Woodbridge (USAFE) RAF Bentwaters England	Daylight Gas 91/96 / Oil	2557
Bitburg Air Base (USAFE) Bitburg AB, Germany	Daylight Gas 80 / Oil	7410
RAF Lakenheath (USAFE) RAF Lakenheath England	Daylight Gas 80 / Oil	2106
RAF Wethersfield (USAFE) RAF Wethersfield England	24 Hours Gas 100 / Oil	2478
Sembach Air Base (USAFE) Sembach AB, Germany	0800-Sunset Gas 80/87 / Oil	06302-7-7630
Torrejon Air Base (USAFE) Torrejon AB, Spain	0800-1700 Gas 115/145 / Oil	6517
PACIFIC AREA		
Clark Air Base (PACAF) Clark AB, Philippines	0600-1800 Gas 80/100 / Oil	23214 24460
Kadena Air Base (PACAF) Yontan Airfield, Okinawa	Daylight Gas 115/145 Oil	24296 24460
Misawa Air Base (PACAF) Misawa AB, Japan	24 Hours Gas 115/145 / Oil	3881 ★

EXPLOSIVES SAFETY

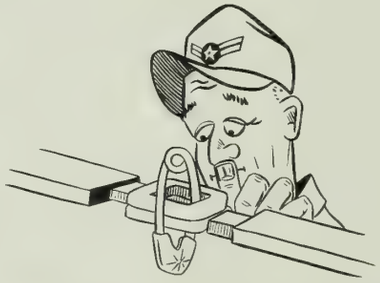
for munitions, weapons, and egress techs



BOMB CARE

After the BDU-33A/B practice bombs were downloaded from an F-4, the bombs were stored nose down in racks on a handling trailer. Normally a simple and safe operation, it was not to be so this time.

The BDU-33A/B carries a signal in its tail which functions through impact inertia. (The signal falls on a fixed firing pin upon impact.) In this case the bomb received some rough handling so that the signal fired when the bomb was placed in the rack. One of the crew had his hand over the signal when it went off, rather than in a safe location on the bomb, and he was injured. Supervisors must continue to stress the elementary principles of explosives safety, and men who work with explosives must take a professional approach to the job at hand.



TOWING TROUBLE

Two airmen towing a pair of M-5 trailers loaded with bombs and rockets to the flight line violated an all important rule of towing safety—*"Make sure the hitch is properly secured."* The tractor driver, after hooking up the first of two trailers to the tractor, maneuvered the tractor and trailer into a position where the second airman was able to hook up the Nr 2 trailer. The second airman later said he couldn't find the pin for the pintle hook, but he did hook up the safety chains. He neglected to tell the driver that he couldn't find the pin for the pintle hook. Enroute to the flight line, the second trailer broke loose from the first trailer as they passed over a ridge in the road. The pintle hook on the first trailer opened, allowing the Nr 2 trailer to swing loose and break the safety chains. Negligence on the part of the airman who hooked up the second trailer was the prime cause of this incident.

On the other hand, proper supervisory inspection of the M-5 trailers would have detected the missing safety pin before the trailer was put into use. Take a good look at your towing vehicles and trailer hitches to see that they are in compliance with TO 36-1-44 dated 18 Jun 69.

Supervisors, be sure all your personnel know why it's important to put the safety pin in the pintle hook. ★



Toots

is interested in your problems. She spends her time researching questions about Tech Orders and directives. Write her c/o Editor (IGDSEA), Dep IG for Insp & Safety, Norton AFB CA 92409

Dear Toots

During a recent flightline visit, I was observing a C-141 refueling operation. From my vantage point some 50 feet from the refueling operation, I was unable to tell which member of the refueling team had possession of the checklist. So I put the question to my escort, a SMSgt. He then informed me that the C-141 Dash 2 states the refueling supervisor will be someone other than the cockpit panel monitor. However, the C-141 refuel checklist states the refueling supervisor will be the man in the cockpit. This would indicate an error in either the checklist or the Dash 2. I asked my escort if an AFTO 22 had been submitted. He said he thought so, but he wasn't sure. How many times have you been confronted with a similar situation?

Observer-at-large

Dear O-A-L

I receive letters all the time from personnel requesting clarification of tech data. To help the technical writers clarify and/or correct the TOs, any time you find something that is not right, submit an AFTO 22, or if you're from the ops side, the form number is 847. Instructions for submitting the forms are in TO 00-5-1. Next time you hear someone cussing out the stupid people who write the tech orders, remind him that tech writers are human and humans sometimes make mistakes. Also, a TO may be correct when published, but over a period of time become outdated.

If you know of a TO deficiency but do nothing about it, you then become a part of the reason the deficiency was not corrected.

Toots

Dear Toots

We have recently been up in the air about an underwater problem. The members of our club, Aqua Falcons Skin & SCUBA Diving Club of Clark Air Base, have had a heated argument over the suitability of the military type flotation device, known as the LPU, to sports SCUBA diving. One school argues that the LPU is good enough for Air Force PJs so it's good enough for sports SCUBA divers. The other school argues that the LPU was not designed for constant use in the water and that because two inflators must be actuated instead of only one as in the conventional vest, that it is half as safe. The vest type will float an unconscious person head out of the water when inflated and there is argument whether or not the LPU will do the same. A diver's vest must be designed for use at depths as great as 250 feet. It must have a mechanical and oral inflator. It must float an unconscious person head out of the water. Do you know of any reason why the LPU unit should not be used by sports divers? Is it any better than the conventional vest type?

TSgt Charles Cardin
Box 1012
APO San Francisco 96274

Dear Sgt Cardin

I checked with one of our flight surgeons who has had some experience in this area. His advice is against using the LPU for SCUBA diving. The basic design is for flotation, not buoyancy control. It is bulky and might lead to entanglements and/or entrapment. Its bulk and underarm location could easily interfere with emergency jettison of tanks and weight belts.

Toots

Ops topics



LACK OF CONTROL

This one's hard to believe! Crew of a two-place tandem airplane was preparing for a cross-country. In the process of jamming his clothes into every nook and cranny he could find in the airplane, the front-seater decided to place his fancy civilian shoes under his seat. But the seat was all the way down. So he waited until after engine start, raised the seat and smartly slid his shoes under it—he thought.

On the way to the runway the two pilots wobbled the stick around the cockpit, but failed to perform a complete "wipe-out" check with it. And—when they got ready to rotate the bird for takeoff, they found the stick wouldn't come back as far as it should.

The aborted takeoff included locked brakes, blown main gear tires and a trip into the mud off the side of the runway.

They found a shoe wedged between the stick well barrier and the lower portion of the control stick.

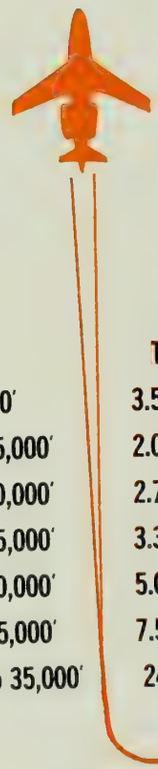
The unit reporting this adventure concluded their report by saying: "We seriously considered prohibiting storage of any personal item under the seat; however, it is our judgment that because of the very limited space available for clothing this would not be feasible or desirable."

Seems like anything would be more desirable than taking a chance on losing control of the airplane—even wearing your size 12 L'il Abner boots to the ball while you're off on a weekend nav prof trip. ★

T-39 THRUST RESTRICTION

The reduction in time-limits for use of military thrust from 30 mins to 5 mins imposed by TO 1T 39A-1S-31, has led to occasional questioning by FAA controllers regarding rates of climb.

The Directorate of Aerospace Safety has forwarded to the FAA Liaison Office the following figures with a request that all controllers be advised of the reduced rates of climb. (Data is based on standard day, maximum weight aircraft.)



	TIME	RATE OF CLIMB
S.L. to 10,000′	3.5 mins	2900′/min
10,000′ to 15,000′	2.0 mins	2400′/min
15,000′ to 20,000′	2.7 mins	1850′/min
20,000′ to 25,000′	3.3 mins	1500′/min
25,000′ to 30,000′	5.0 mins	1000′/min
30,000′ to 35,000′	7.5 mins	660′/min
Total Time to 35,000′	24 mins	@ average 1450′/min

It would behoove each FSO to pass this information to his local Air Traffic Control Board so "everyone gets the word." It could help allay some of the existing confusion over why we're now taking so long to get to altitude. ★

Maj Edwin L. Marsh
Directorate of Aerospace Safety

DON'T-EJECT LIGHT

In a recent F-4 incident, the front canopy came off the airplane shortly after takeoff. The aircraft was just about to enter a 500-foot overcast, and the aircraft commander made a quick decision, pushed over and stayed visual below the murk.

Wind noise in the cockpit made communication between the two pilots impossible. With the bird nosing toward the ground in an increasing bank, the rear-seater couldn't tell if his buddy up front still had control of the situation. The GIB ejected; the A/C brought the bird home with BOTH canopies missing.

We don't fault the rear-seater for ejecting even though he had not seen the "eject" light. As far as he knew, he had no way of communicating with the front seat, and the ground was coming up at an alarming rate.

Although the unit to which this crew and aircraft were assigned apparently didn't employ it, there is another means of communicating between cockpits in this situation. Many two-place fighter and interceptor outfits have briefed variations of the system over the years.

All you need is a light that can be switched back and forth between the cockpits—such as the TACAN or command radio control indicator light. In a situation where interphone is lost or unusable, and there is a question of abandoning the aircraft, the front-seater can flash this light in the other cockpit to indicate that he has the situation under control and there is no need to eject (a "don't eject" light). If the back-seater hasn't received such a signal, but is wondering about it, he can interrogate the front cockpit by flashing the light. If he receives a flashing light in response, all is well. If he receives no response after a reasonable length of time or sees an "eject" light (this will depend upon the circumstances), he's cleared to go.

Of course, this system must be briefed and understood in advance. It should be standardized among all crews in the outfit, and specifically briefed, or at least referred to during each pre-mission briefing. Since these navaid or radio control lights are often on a side panel under your elbow in the cockpit, the pilot in front should think to look specifically for the light when he's lost intercom with the other cockpit. Better, he should signal his all's-well to the rear seat as soon as possible after the canopy unexpectedly departs—or in other similar situations. ★

FLIP CHANGES

Terminal Control Area (TCA) procedures were expanded, effective 20 Aug 1970, to include the Chicago and Washington DC areas as well as Atlanta. See Special Notices, FLIP Planning Section II, N&S America.

In the interest of economy, production cycles for many FLIP products, world-wide, have been or will be expanded, i.e., U.S. Terminal High Altitude Procedures are now published every 56 days vice every 28 days. Users are requested to check expiration dates closely and to care for the publications wisely in order to make them last throughout the expanded periods. ★

ROLLING TAKEOFFS

BAK-type arresting gear cables are very efficient at catching airplanes. For most of us that's a good deal—and we're happy about it. But not so for the T-39 types; they're not too happy about all that efficiency because the cables frequently catch, bend and disfigure landing gear doors on the Tiny 'Liner.

Recent case in point: A not-too-experienced T-39 pilot attempted a rolling takeoff over a BAK-9 cable. He thought he'd held the speed sufficiently low until he'd crossed the cable, but apparently he wasn't slow enough. After he was airborne, he couldn't get the gear to indicate up and locked. After the bird landed, both main gear door leading edges were discovered bent. And the right uplock roller was found adjacent to the cable on the runway.

Lesson: Forego the rolling takeoffs in T-39s when there's a cable on the runway. *Taxi* across it, then take off! ★

Ops topics

CONTINUED

THANKS, TOWER!

It was one of those little, barely adequate fields in Southeast Asia that C-130s frequently use. Parking and ramp space were at a premium, and when the big birds landed they immediately back-taxied up the runway to the aerial port ramp. This arrangement worked well as long as traffic wasn't too heavy.

But then one day when a C-130 landed, he was instructed by the tower to clear the runway onto the small civilian ramp. A C-47 had landed behind the C-130 and would have to clear the runway before the C-130 could taxi back on the runway to the aerial port ramp.

To give you an idea of how small this civilian ramp was, the C-130 pilot had to taxi with his left wingtip up against a fence in order to keep his right wing from overlapping the runway. To add to his concern, the ramp was covered with numerous large rocks (3 to 4 inches in diameter) which were used to fill holes in the ramp surface. While he diverted his attention momentarily from his wingtip to the ramp surface, the wing brushed against a lamp pole and then contacted the corner of a building. He brought the bird to a stop, reversed and extracted the wing from the building.

According to the rules, the pilot was at fault—he picked up the primary cause. Contributing was the airbase in that the maneuvering area is extremely limited for C-130 aircraft.

But what about the control tower? A little judicious spacing of landing traffic could have averted the whole flap. ★

ASKING FOR TROUBLE

It was to be a simulated right-engine-out landing on a first pilot upgrade check in a T-29. At touchdown the IP put the left engine in reverse. As the bird drifted alarmingly toward the left side of the runway, the IP took control and applied full right rudder and then right brake. He observed no reaction to either. Even with full right turn on nose wheel steering, the airplane continued to slide. It went off the left side of the runway. When the IP finally put the left propeller in forward range, the airplane straightened out and paralleled the runway until it ground to a stop.

Damage was limited to a couple of runway lights and some bent and chipped propeller blades.

The report named hydroplaning and weathervaning as the cause of the incident because it was raining and there was a 16-knot wind blowing across the runway. It didn't criticize the IP's judgment. The unit decided to "brief all pilots on dangers involved in practicing a single-engine reverse on a wet runway with a crosswind."

The key word here, of course, is "practicing." You may have to do your single-engine thing on a slick runway with an adverse wind some day, but there's no point in practicing under conditions that bad. You don't set the wing afire before practicing engine fire procedures do you? ★

TEMP CONVERSION

Ever get a temp that you wanted to convert quickly from Centigrade to Fahrenheit and you didn't have a computer handy and couldn't remember the formula? Here's an easy way we picked up from Air Canada's *Grapevine*. They credit Navigating Officer L. Vanden Driesen and Second Officer B. J. Caldwell for it.

°C, double it, subtract 10%, add 32.

Ex. 1: 10°C = 10 X 2 = 20
Subtract 10% −2
18
Add 32
Answer 50°F

Ex. 2: Watch the sign!
−40°C = −40X2 = −80°C
Subtract 10% = −(−8°)C
−72
Add 32
Answer −40°F

TECH DATA PACE

Lt Col Robert E. Walker, Directorate of Aerospace Safety

The Air Force is experiencing an alarming rash of mishaps which can be attributed to deficiencies in the use of technical data. Too many reports of investigation, board proceedings, inspections and evaluations include these familiar words: "Improper tech data was used . . . ," "Tech data was available but not used . . . ," "I used it but I missed that step . . . ," "I thought that he did it so I checked it off . . . ," "The TO's wrong so I did it the way I thought was right . . . ," etc. On it goes—the endless list of glaring, infamous details which when put together ultimately made an incident or accident inevitable.

In many instances briefings which cover mishap details serve as a part of the corrective or remedial action. Although this approach does have merit for illustrating what can and does happen, there are some basics which may assist in reversing the untenable trend toward poor use of technical data.

A review of mishaps provides some guidelines for preventing future incidents and accidents related to technical data. There are four areas which include a significant majority of the mishaps caused by erroneous use of tech data. These are:

PACE

Preparation. Many instances cite circumstances where technicians, mechanics, or aircrew members fail to have the proper tech data to perform all the necessary tasks. This varies from wrong tech data to no tech data at all. A few additional minutes of proper preparation to permit confirmation of the tasks to be performed and the availability of current tech data can save time, money, damage and embarrassment.

Attention. Too many reports relate details which, in the final analysis, could only occur because the individual was not paying attention to what he was doing. Lack of attention is the primary cause for:

- Missing steps or notes
- Performing steps out of sequence
- Not utilizing additional references
- Using the wrong tech order
- Not confirming tech order page currency

Correction. Synonymous with the previous observation is the case for correcting known tech data deficiencies. Errors are discovered or changes and improvements become necessary. Yet, individuals delay in generating change action to have a correction formally accomplished. Details and instructions for submitting corrective actions are outlined in Section VIII of TO 00-5-1. If need develops for a new tech order in the system, a letter should be submitted to the applicable Tech Order System Branch identifying the requirement.

Education. Keeping the concepts of proper application and use of tech data foremost in the thoughts of the users is the most important aspect of all. Formal programs of both education and emphasis are currently in operation. But new ones can and should be developed. It's time for a revitalized approach to the tech data dilemma. An improved approach through more subtle means cannot be overlooked. Slogans, posters, informal discussions —all have their place in developing a tech data PACE program.

Now is the time to review your unit's tech data PACE program. How does it stack up? Spend some time evaluating the efforts expended in your unit for reducing mishaps through faulty or erroneous application of tech data caused by a lack of:

Preparation
Attention
Correction
Education.

Get in stride—keep PACE with tech data! ★



NUCLEAR SAFETY AID STATION



LOST HIS COOL

At an operational missile complex, a technician accidentally tripped a circuit breaker to the OFF position, which removed all readiness power from the complex. The technician immediately realized what he had done and took action to restore readiness power. Upon restoration of power, all of the water sprays in the silo activated and the Missile Combat Crew Commander's attempts to deactivate the sprays were unsuccessful. He then dispatched a technician into the silo, *alone,* to ascertain the extent of the problem. The silo is a NO-LONE ZONE and whenever a war reserve reentry system is mated to the missile, lone access is strictly prohibited.

This case illustrates a flagrant violation of the Two-Man Concept. The Two-Man Concept is a very important element of the Air Force nuclear safety program and is designed to prevent individuals from committing incorrect or unauthorized procedures which could result in a catastrophe. As it turned out we had a happy ending, but it could have gone the other way. In an emergency, don't panic and by all means follow emergency procedures **to the letter**

BACKWARDS

While performing Dash One-A maintenance, a technician inadvertently reversed a bracket on a warhead component. He immediately realized the bracket was on backwards. When an attempt was made to remove the bracket, he found it had seized to the component and was unable to remove it. The component was returned to the depot with the bracket attached. Embarrassing? Yes!

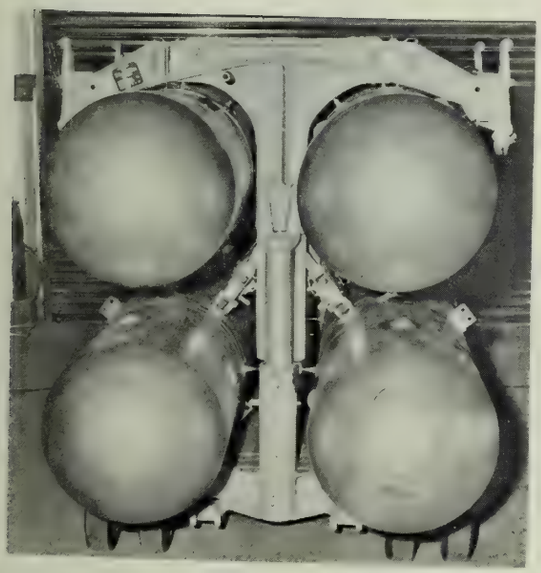


WR OR TR- MURPHY'S LAW AGAIN

What would you answer to a quiz question asking, "Are training quality components authorized for use on war reserve nuclear weapons?" Your answer would be an unqualified "No." Common sense would dictate this answer as well as the definition of a training quality item in TO-11N-4-1. Recently, an initial inspection of a WR weapon revealed that both suspension lugs were metal stamped "TR" above the part number. In addition, the bottoms of the lugs were marked "TR" in one-half inch characters (maybe Braille would help). Do not be a victim of "Murphy's Law"—keep your eyes open.



PINTLE HOOK BENDS BOMB



A loaded MHU-20/C clip-in had been transported from storage to the Maintenance Bay on an MHU-19/E for demating. During demating, the team chief noted a dent in the fuze section of one weapon. The unit was rejected and an investigation conducted. The towing operation had been accomplished with a farm tractor equipped with more than one pintle hook. It was determined that the hook on the left side of the tractor had contacted the bomb during a left turn. Neither the driver nor the team chief had observed the incident. Safety consciousness and motivation seem to be lacking in a situation like this one. The possibility of such an incident should have been apparent to the people involved and additional care should have been taken. "Should have" sounds like a Monday morning quarterback, but the need for constant safety vigilance is definitely illustrated.



NUCLEAR SAFETY AID STATION

CONTINUED



LEFT IS RIGHT AND RIGHT IS LEFT

While drilling secondary drain holes, a missile maintenance team inadvertently drilled into the missile lower umbilical cable. Procedures for this drain modification required that a hole be drilled through the launch tube liner at approximately 165 degrees as measured on the collimator bench. This is in the vicinity of the lower umbilical cable. At the time of the drilling, one team member was observing the operation from the work cage inside the launch tube and another team member was outside the launch tube doing the drilling. The third team member was in the upper equipment room observing the operation from the diving board area. The two men on level two were using two small pipes as a reference point for measurement. These two pipes are about four inches apart and lie between the launch tube heating duct on the right and the lower umbilical on the left as viewed from inside the launch tube. The maintenance man in the work cage estimated that a distance of about 12 inches, measuring left from the small pipe on his left across the lower umbilical, would put the hole approximately four inches to the left of the umbilical. He then told the maintenance man who was to do the drilling to drill the hole 12 inches from the left pipe. The man on the outside of the lines measured approximately 12 inches from the pipe on his left instead of the pipe on the left of the man inside the tube. Whoops—there goes another umbilical!

Confused? So were they!

BUDDIES

During a routine Guidance and Control (G&C) recycle, operations proceeded smoothly until step G, paragraph 4-5, TO 21M-LGM30A-2-10. While the crew was attempting to remove the access cover to the first ignition safe and arm device, three fastening bolts seized. The crew then proceeded to remove the reentry vehicle, penetration aids, and the G&C unit without pinning the first stage. Quality control inspectors arrived on the scene and discovered the discrepancy. The team was relieved and another team was dispatched to remove the access plate, install the safing pin, and complete the G&C recycle.

This is an object lesson in negligence on the one hand and proper follow-through by the inspectors on the other. Attention to detail and nuclear safety are good buddies.



FOLLOW THE CHECKLIST

Over 1300 gallons of diesel fuel were spilled onto the equipment area in a missile silo during the refilling of a diesel fuel service tank. It appears that the technicians started the diesel fuel service pump and then left the silo area, in violation of technical order procedures, and proceeded to the Launch Control Center. Approximately four hours later, an alarm sounded in the control center and the technicians were dispatched into the silo to investigate. The diesel fuel had overflowed from the service tank onto the equipment area. Damage, fortunately, was limited to flex-ducting in the launch duct air conditioning system. This incident would not have occurred if the personnel involved had complied with the procedures in the applicable SAC Civil Engineering Manual. How many times have you heard—"Follow the checklist"?



FOR WANT OF A COTTER PIN

While downloading a B28 from an F-104, the rear lug hung up momentarily in the rack hooks—then released. The rear of the weapon abruptly dropped some three inches, breaking the pulse plug break pin. A detailed inspection of the MJ-1 table assembly cradle revealed that a cotter pin was missing from the lateral cylinder assembly. The absence of this pin led to the loss of the cylinder bracket locking pin and resulted in about one inch free play of the table assembly. Apparently, this free play allowed the aft lug of the weapon to bind in the rack hooks. For want of a cotter pin. . . .

DANGER — TRAPS on the FLIGHTLINE

Back in the pre-jet days one of the first things new flightline mechs learned was to beware of propellers. Most caught on quickly, but a few didn't and they either bear the scars or now rest beneath a marker engraved "Here Lies. . . ."

Perhaps some of us thought the jet would solve this problem. It didn't, for two reasons:

We still are not an all-jet air force, and

Jet engines can and do suck in or blast unwary people with sometimes fatal results.

So we not only have to teach the young airman respect for the whirling blades of a propeller but to give jet engine intakes and exhausts equal respect.

Unfortunately the problem is not that simple. Unless one is a fool, he will immediately recognize the danger in approaching too close to a propeller. Even when the engine is not running, one must use caution and be absolutely sure that someone in the cockpit is not about to fire the thing up.

In case you're thinking all this is obvious and why all the fuss, here's why:

IN THE PAST 10 YEARS 17 PEOPLE HAVE BEEN KILLED BY AIR FORCE AIRCRAFT PROPELLERS!

It would be logical to assume that the numbers have diminished over the years. Not so. 1968 was one of our worst years with four killed. That equalled 1960 (see the table on page 39.) And we have had some serious injuries this year.

A review of these unfortunate accidents does not indicate a clear pattern. Some occurred when men working in proximity to the aircraft apparently became distracted, or were so engrossed in what they were doing that they failed to notice the turning prop blades. Several involved non-flightline personnel who for some reason got into the path of moving aircraft or ran into propellers.

Mishaps involving jet engines are more numerous but generally not as drastic. These usually occur when mechanics working on the aircraft, such as trimming an engine, are sucked into the intake. Such incidents are seldom fatal but they frequently result in serious injuries. For example, one airman lost all the fingers on one hand and another lost an arm.

There have been several incidents in which airmen have tried to prevent foreign objects from entering the intake of a running jet engine only to be sucked in themselves. Their intent was laudable but not very smart. We can almost always fix a damaged engine but a man is something else.

Of course, both ends of a jet engine are dangerous. An airman was killed when he was cartwheeled nearly 100 feet by jet blast behind a fighter.

Another hazard around aircraft: people get caught in flaps and powered doors such as wheel well and bomb bay doors, sometimes with fatal results.

Now if you're looking for some words of wisdom—a sure-fire way to prevent these unfortunate mishaps, sorry. The learning process in this case does not lend itself to demonstration. About all we can do is tell you it can be very dangerous. Caution is up to you!

On second thought, though, there are a few things we could suggest.

If you are a supervisor, make sure your people are aware of the various traps they can get into around aircraft — props, intakes, flaps, doors, blast.

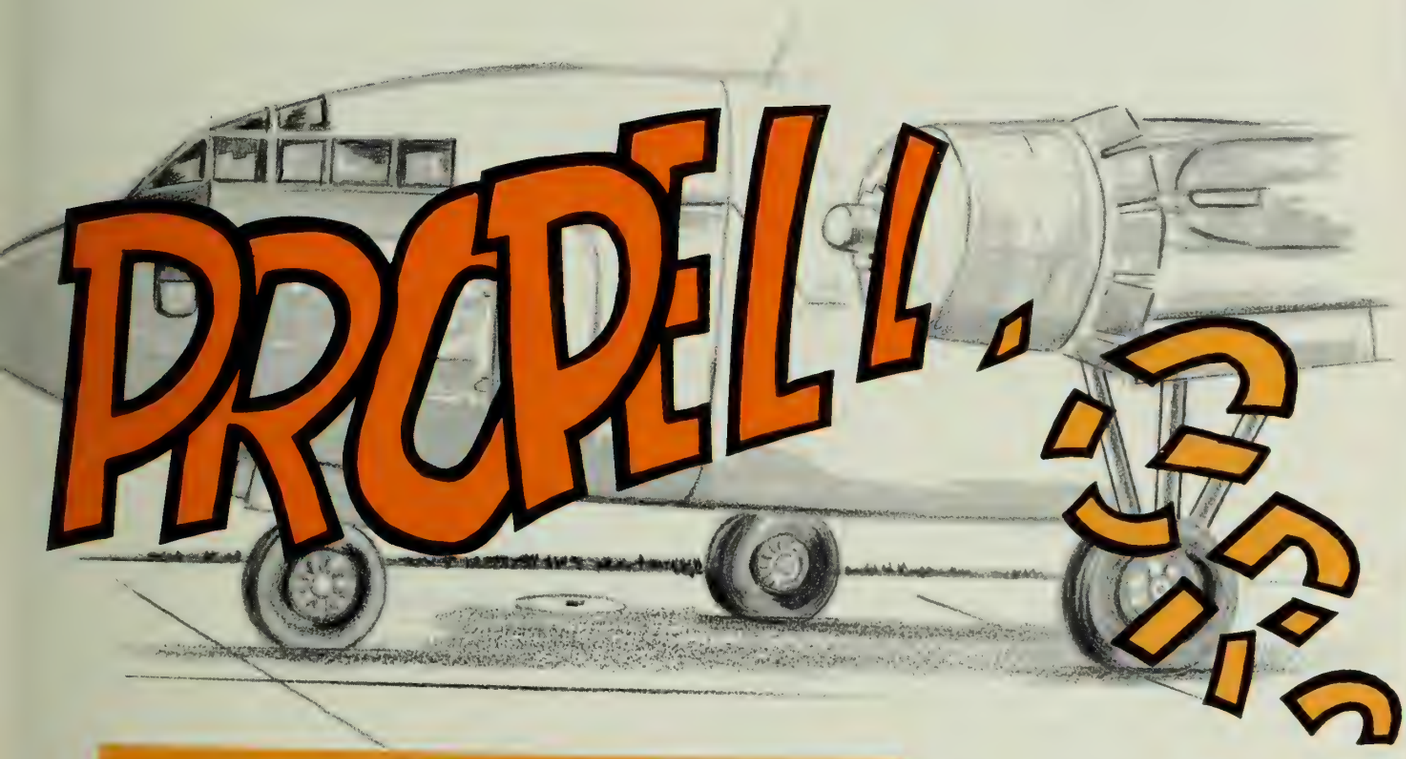
As an individual you can make sure that you know about these things and don't let your mind wander when you are in their vicinity.

Be aware that noise is a factor in most ramp accidents. It's surprising just how much we use our ears to alert us to approaching danger. But if the noise level is high in the general area, this ability is seriously degraded to the point we have to rely almost entirely on sight. This tends to explain why whirling propellers, especially at night, are just not seen until too late.

Good organization and the systematic use of checklists will prevent most of those nasty little surprises, such as a flap being retracted when you're working in the well.

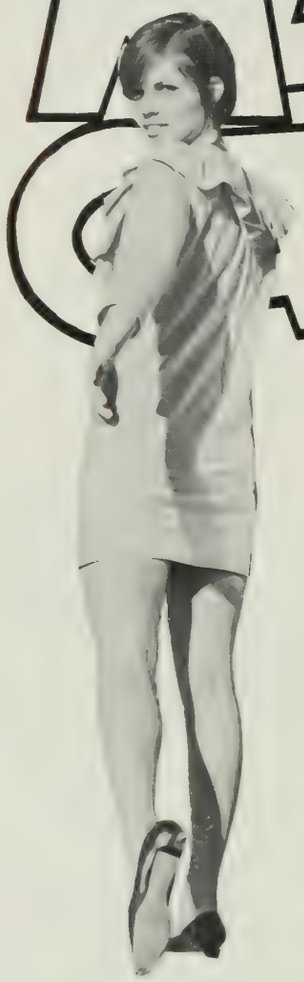
Finally, the flightline is a good place for the buddy system. Help look out for the other guy. You might even save his life. ★

BEWARE OF PROPELLERS



WE LOST			
1969	1	1964	0
1968	4	1963	2
1967	1	1962 HELICOPTER	1
1966	0	1961	1
1965	3	1960	4

MAIL CALL



ELECTRICAL HAZARD INFO

I was stationed in the USA last year (Comm. Course, Class 680410, Keesler AFB, Mississippi) and I know how important safety is to prevent electrical hazards. Now I'm stationed in Los Cerrillos Chilean AFB, Electronics Dept. Will you please send me some Safety Signs?

By means of your magazine, I would like to express my thanks to my classmates and instructors, wherever they are, for making my stay in your wonderful country such a happy one.

Capt Edgardo Yanez
Grupo de Aviacion No. 7
Base Aerea Los Cerrillos
Santiago de CHILE

Unfortunately, we do not have any posters on electrical or electronic hazards in our files. We are sending you a pamphlet, "Electric Shock"; the April 1969 issue of Aerospace Safety magazine which contains an article on electricity ("A Shocker," page 24); and the July 1969 issue containing "Do It Yourself Electrician" (page 20). I hope these are useful.

We are pleased that you enjoyed your stay and training in the United States, and are glad to pass on your message to your friends.

RADIO OUT PROCEDURES

The back cover of the May issue instructs pilots to SQUAWK Code 7600 if their radio is out, but neglected to advise them that the procedure only applies to IFR flight plan aircraft and that FAA does not interrogate Code 7600 continuously. Code 7600 is normally interrogated and monitored only when an IFR aircraft is suspected to have experienced radio failure.

The DOD (IFR) Enroute Supplement, page 425, establishes the procedure for aircraft on an IFR flight plan. However, paragraph 4, page 1-75, Airman's Information Manual, does not restrict use of the procedure to IFR aircraft. FAA was requested to consider revision of the AIM instructions to preclude misunderstandings and complaints by pilots on VFR flight plans who may expect a service that will not be provided.

Recommend the next issue of the magazine clarify the use of Code 7600 as being for IFR flight plan aircraft only.

Lt Col Doris D. Williams
Director, NAVAIDs Operations
Oklahoma City, Okla.

Thanks for the clarification. Jocks, take note.

RIGHT UNIT, WRONG PLACE

I can't spell Mabuhay, the greeting of the Philippines, so I'll have to say "Aloha." I've got one whole week behind me as a Clark AB resident, working in the 13th AF safety office. One of the first irate letters from readers that showed up in the "In" basket came from a member of the 355th Tactical Fighter Wing at Takhli. The page of your July issue identifies the "356th Tactical Fighter Squadron" at Takhli as recipient of a USAF Flight Safety Award. But there is no 356th at Takhli. He wants to know if the unit cited should be the 355th at Takhli—if so, "send us our prize."

Lt Col Carl Pearson
Clark AB, P.I.

You're right, there was a goof. Not ours this time, as we printed it just as we received it, but nevertheless the list of Flight Safety Awards for 1969 should have read "356th Tactical Fighter Squadron, Misawa AB." Better luck to the 355th next year.

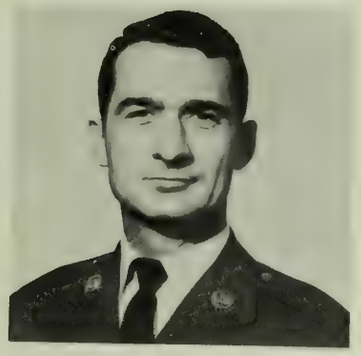
☆ U.S. GOVERNMENT PRINTING OFFICE 1970 431-457/

UNITED STATES AIR FORCE

WELL DONE AWARD

Presented for outstanding airmanship and professional performance during a hazardous situation and for a significant contribution to the United States Air Force Accident Prevention Program.

MSGT JAMES A. ELLIS



TSGT JAMES A. HICKS



TSGT WILLIAM B. LANE



1 Special Operations Wing, Hurlburt Field, Florida

On 25 March 1970, Sergeants Ellis, Hicks and Lane discovered a critical defect in the Yankee Egress system of the T-28D and A-1H type aircraft which could have caused the system to fail if it were utilized during an emergency. While following up an EUMR on the T-28D primary extraction control handle, Sergeant Ellis from Quality Control examined an ejection system from a crash-landed A-1H that was in the Egress Shop. He noticed that the pulley stud was sheared and lying on the floor under the seat. He notified Sergeants Hicks and Lane of the Egress Shop who discovered that the pulley link lever had fallen loose. The pulley cover was pulled and after careful study, they determined that this failure was not caused by the aircraft accident. Realizing the seriousness of the failure and that pilot extraction would have been impossible, they informed their Materiel Officer who, in turn, notified the appropriate agencies.

SMAMA immediately grounded all T-28Ds and A-1Hs for a one-time inspection. This inspection was accomplished and three A-1Hs and seven T-28Ds were found with the same defect. Research revealed that the mechanical firing assembly required a 40-pound force to actuate the initiator; however, the pulley stud was shearing under an 18 to 20-pound force. Close coordination between two AMAs and Sergeants Hicks and Lane resulted in immediate replacement of the old aluminum studs with new steel ones and inclusion of these studs in the periodic seat inspection criteria. Within three days, Sergeant Hicks and Lane reinstalled the new studs in all the organization's T-28Ds and A-1Hs.

The outstanding achievement of Sergeants Hicks, Lane and Ellis is a significant contribution to the safety and well-being of all aircrews. WELL DONE! ★


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Aerospace Safety



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Aerospace SAFETY



COVER PHOTOGRAPH "A-1H SKYRAIDER" BY SSGT ROBERT WICKLEY, AEROSPACE AUDIO VISUAL SERVICE.

FOR AIRCREWS, MAINTENANCE & SUPPORT TECHNICIANS

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Inspector General, USAF

MAJ GEN EDWARD M. NICHOLS, JR.
Deputy Inspector General for Inspection and Safety, USAF

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COL FERDINAND BARNUM
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MR RICHARD F. GERWIG
Chief, Reporting and Documents Group

COL DAVID M. CRITCHLOW
Chief, Systems Safety Engineering Group

SPECIAL FEATURES

LET'S GET INVOLVED... *in finding a better way*
1-2-3, YOU'RE OUT... *how many strikes are on you?*
LIGHT PLANE LOSSES... *inexperience plus poor judgment*
CAT—RULES OF THUMB... *for avoiding clear air turbulence*
METAL FATIGUE IN AIRCRAFT... *"things pilots and mechs should know"* ..
THE HIGH COST OF FOD... *is not governed by the size of the object*
WINTER AIRCRAFT OPERATION... *tips for "cool" operators*
POOR TORQUING... *proper procedures and tools are necessary*
SHOW ME!... *pictures don't lie*
NDI—MURPHY'S NEMESIS... *nondestructive inspections*
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TECH TOPICS
WELL DONE

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DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USA

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NOVEMBER 1970 AFRP 127-2 VOLUME 26 NUMBER

*i*nvOLVeD

The weather we live with 'cause there just isn't a whole lot we can do about it. Sure, there has been some success with cloud seeding, but by and large we just have to accept the weather as it comes. However, most of the other factors related to the flying business can be improved if we are willing to expend a bit of effort. It's a sad fact, however, that 20 minutes after landing, most pilots forget whatever it was that was so irritating while airborne.

How about the case where, after handoff to final approach, the radar controller comes at you with the wrong tail number? You feel fairly confident that you're the one he is talking to, but with lousy weather and a few hills scattered around, you can't rely on "fairly sure." By the time you get things sorted out, the approach gets scrubbed. No doubt the commander of this unit would like to hear about the incident; but, since this might require a phone call or an OHR, the matter is ignored.

Then there is Joe Jock who makes an entry in the 781 "Engine runs rough"—period. That piece of information along with the date and pilot's signature is almost worthless. Naturally, this type of write-up is going to cause many extra hours of work for the maintenance troops. There must be a better way. In most cases a briefing by the Maintenance Officer at a pilots' get-together can eliminate many of these fuzzy write-ups.

Too frequently, both knuckle busters as well as aircrew members, have the feeling that published Air Force procedures come straight from an infallible source. Granted, much time and analysis go into writing procedures, but the job is accomplished by guys like you and me. I don't know about you, but I know that some of the things I do leave room for improvement. If you see a procedure you feel is not right, question it. Perhaps there *is* a better way.

How about the Operational Hazard Report? How long has it been since *you* wrote one? A lot of Air Force troops have never written one and some don't even know what an OHR is.

There is no way of knowing how many mishaps or accidents have been averted by somebody who filed an OHR when he saw a hazard, but we know it's been a bunch. So don't be reluctant to fill out the OHR form for fear that maybe the hazard doesn't really exist. You may be the only one in a position to recognize the hazard. True, some of the hazards we hear about are not valid, but investigation by the safety officer frequently turns up another area that merits attention; and this bit of paper is one quick way to get the commander's attention.

To use the ol' cliche, "Safety is everybody's business." What we're asking *you* to do is get *involved.* If you see an unsafe practice or a situation that could lead to an accident do something!! Don't assume that someone else is going to take action. Just because you're an A1C doesn't mean you don't have the rank to point out a weak area in our system. Even if you're wrong in your analysis, I'd be willing to bet your supervisor will more than appreciate your effort to improve a situation. Safety is simply common sense and it's *you,* the users, that are going to get things changed if they're not right. Don't live with an unsafe procedure —take the appropriate action to get it corrected. ★

LET'S GET

1-2-3- YOU'R



An airman in the left seat of an O-2 was about to taxi to another parking spot with a sergeant in the right seat checking him out. The before-taxi checklist calls for gear handle DOWN, to close the gear doors. So the airman, probably a little tense, pushed the handle UP. The next thing they knew the nose gear was in the well and the front prop was chewing up the ramp. Result: one prop and one engine had to be replaced.

* * *

During takeoff at sea an HU-16 unexpectedly became airborne in a right skid and right wing low. hit the water again, bounced in the air and right float sheared. T pilot could not bring the wing and the aircraft went in right wi and nose low. The crew managed get out but the aircraft sank.

* * *

All pre-takeoff checks for the were normal and the pilot began takeoff roll. At 160 knots the speed indicator stuck. He contin the takeoff but about 30 seco later the IAS went to zero. AOA was functioning normally the pilot stayed in the local a burned off fuel with intention landing. But during a landing c figuration check at 10,000 feet, AOA stuck at eight units and off flag came up. With both the mary and secondary airspeed re ences inoperative, the pilot ca his command post for an aircra pace him for a landing. This wo out okay and Maintenance got t

E OUT!



hands on the intact airplane. They found leaf particles and evidence of an insect nest in the pitot tube and intermittent power failure in the AOA instrument.

* * *

From the facts given, it may not be evident, but you know that there must be some relationship, a similarity, among these three events for us to have listed them here together. The connecting link, the thing in common, is that each of these mishaps resulted from more than one failure. Accidents frequently do, so if we can prevent *one* possible cause, we may be able to prevent an accident.

The airman who moved the gear handle the wrong way made a mistake. But it wouldn't have caused any damage if there hadn't been a contributing factor. The landing gear lever lockout solenoid stuck with the solenoid pin retracted. This permitted the gear lever to be placed in the up position while the aircraft was on the ground.

The HU-16 accident was set up by the float striking the water and breaking off. However, the primary cause was materiel failure of the number one engine mount or its support structure, probably because of a pre-existing defect (perhaps a crack). So we also have more than one cause factor at work in this accident. In addition, despite the age of the HU-16, there are still some inconsistencies in tech order phase inspection requirements which permitted certain components of the Nr 1 engine mount assembly to go uninspected for flaws such as a break or crack.

As for the F-4, how did the bug nest get into the pitot system? Well, the bird had been parked for two and a half weeks and someone did not install the pitot tube cover. There was no accident, but all the ingredients were there if circumstances had been different, such as instrument weather.

As it turned out only one of the events related resulted in a major accident. But it was real serious. Six men in the HU-16 could have lost their lives but fortunately, were quickly rescued. As it was the Air Force lost an airplane.

The point I'd like to make here is that we all have some margin going for us but we never know just how much. We may be able to get away with a minor mistake, a shortcut that produced a job that wasn't quite as good as it should be, an oversight such as leaving out a cotter pin—or failing to set the right numbers in the altimeter. Yes, we may get away with these things. Then again we might not.

Crewmembers bet their lives on their airplane being in safe flying condition. Consequently, only the foolhardy fail to carefully preflight. This won't find every possible flaw, but it is designed to reveal some of the more obvious and critical possibilities. Thus, the crew (whether one or more) is partially responsible for its own safety.

The maintenance people share this responsibility and, by their diligence, save lives and aircraft when they correct something that could cause an accident.

Since so many of these events we call accidents result from more than one mistake or malfunction, the last chance inspection conducted at many fighter bases takes on extra value. The loose fastener, cut tire, fluid leak, etc., discovered there does not fly off to disaster when coupled with another failure. The pilot might be able to cope with one failure such as loss of brakes. But what if he took off with a cut tire and then has to deal with a blowout *and* no brakes. Although it's rare, let's slip in a barrier failure. It does happen from time to time.

What all this adds up to is that one strike may not put you out, but 2-3 and that's all. Let's all work on eliminating those second and third strikes. ★

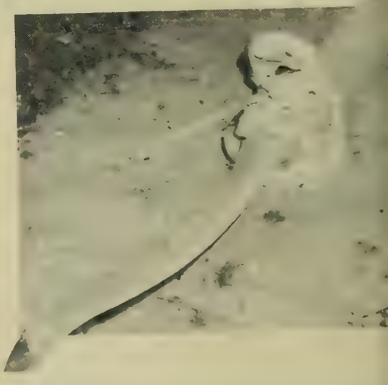


LIGHT



Four years ago *Aerospace Safet* reported on accidents involvin Air Force personnel in light ai craft. The article said that non-aer club general aviation accidents ha cost the Air Force 25 lives over 21 month period.

That was four years ago. What the situation today? There has bee very little improvement. During th past 30 months the toll has been 2 lives and 14 injuries in 37 accident







LIGHT PLANE *losses*

The numbers are for Air Force personnel and do not include others killed or injured in these accidents. (Aero club statistics are not included.) The records indicate the loss to the Air Force to be $1,293,-190. This is based on formulae provided in AFM 127-2. But this fails to take into account several factors that increase the cost to the Air Force many times over.

For example, one of the men killed in a light aircraft accident was a young lieutenant who had just graduated from pilot training. In another crash three captain navigators lost their lives. The potential lost to the USAF from these tragic fatalities can hardly be measured in terms of dollars, but surely would amount to much more than the $35,000 each as figured on the basis of AFM 127-2.

Perhaps it seems cold-hearted to measure a man's death in such terms. But such losses must be so reckoned along with the loss in mission capability each fatality represents.

It is difficult to get a handle on the exact cause of each of these accidents because they are not investigated by Air Force accident investigation boards, in the same manner as are USAF aircraft accidents. General aviation accidents are investigated by the National Transportation Safety Board and, as of this writing, many of the reports were not available. Therefore, the information provided here is based primarily on Air Force casualty reports which did not always contain all the factors. However, there was generally enough information to obtain a fairly good idea of what caused the accident.

Approximately half of these accidents were obviously the result of pilot factor. A few were due to engine failure and most of the rest were classified as undetermined either because the reason was unknown or the final report from the NTSB was not available. In some cases the pilot's qualifications were unknown.

At least eight of the pilots could be considered highly qualified in that they possessed either a commercial license, an air transport rating or were rated military pilots. Approximately the same number had private licenses and a few were student pilots. A few of the killed and injured were Air Force personnel riding as passengers.

Now, let's look at some of these accidents to see what happened. In one, in which six people lost their lives, a young recent graduate of USAF pilot training took five friends on a sight-seeing and photography ride. While flying in mountainous terrain they apparently got trapped in a canyon and crashed into the side of a mountain. The aircraft was not located for several months and when it was found no attempt was made to remove the wreck-



age because of its nearly inaccessible location.

This young pilot could be considered as well-qualified in some types of flying. He was not experienced in flying light aircraft at low altitudes in mountainous terrain, which very possibly was the major factor in this accident, along with poor judgment.

The three navigators lost their lives during takeoff in high winds when the aircraft struck power lines just off the end of the runway and crashed. While the primary cause was undetermined, the combination of wind and turbulence in the lee of a nearby mountain were listed as most probable.

Two highly experienced USAF pilots were killed attempting acrobatics in a light plane at very low altitude. The aircraft had been modified structurally and with a more powerful engine to make it aerobatic. However, it was still operating on an experimental ticket that restricted it from aerobatics and carrying passengers. The pilots not only violated several FAA rules but they exercised extremely poor judgment in attempting a loop close to the ground.

Inexperience combined with a hazardous operation probably cost a sergeant his life. He was flying an agricultural mission in a light plane which apparently crashed when the sergeant attempted a low speed turn on the deck.

A USAF pilot with 8000 hours military time and about 500 civilian flying hours died when the light plane he was demonstrating stalled and spun from between 1500 and 2000 feet. This may have been a case of overconfidence; surely this pilot would not have attempted to demonstrate a stall at that altitude in the big transport he flew for the Air Force.

Another Air Force pilot was flying at extremely low altitude when he attempted a turn and the left wing struck a tree. The wing separated and the aircraft immediately crashed, killing the pilot. There was evidence that the root causes of the accident were fatigue from lack of sleep, alcohol and carbon monoxide.

In addition to the lieutenant who flew up a deadend canyon and perished, an Air Force nurse, a pilot but riding as a passenger, was killed in the same kind of accident. Another lientenant and his wife flew into a similar situation in that on a sight-seeing flight, he realized he could not clear the terrain. He attempted a turn but the aircraft struck some trees and burst into flame. The pilot, his wife and a third passenger all suffered serious burns.

A captain was killed when his light plane collided with a civilian jet transport.

Determining the causes of some of these accidents may be difficult, but probably not as much so as coming up with some means of preventing them. Commanders and supervisors are limited for the most part to education as a preventive tool. And education doesn't always take. Almost without exception the people involved in these accidents had been counseled and received at least occasional briefings on the hazards of light aircraft operation.

A common thread that seems to run through a majority of these accidents is lack of good judgment. That plus inexperience is a highly dangerous combination.

Another thing that stood out in the accident reports was that very possibly some fatalities might have been avoided and injuries at least lessened if the aircraft had been equipped with shoulder harnesses. It is the author's opinion that every light aircraft should be equipped with shoulder harnesses and that the occupants should use them.

One preventive tool commanders have is support of Air Force aero clubs and encouragement of membership and flying in aero club aircraft. Today these clubs have very good equipment and they provide guidance and some control particularly over students and pilots with limited experience. Their safety record for the past few years has been outstanding. During the two and a half years covered by this article in which 28 Air Force personnel were killed in light plane accidents outside of aero club flying, the aero clubs had only 11 fatalities. And they flew more than 650,000 hours during that time. The accident rate last year was 10.2, about one-half the overall general aviation rate, and the fatality rate only .75 per 100,000 hours of flying—approximately one-third the general aviation rate.

Supervisors should identify those individuals who engage in hazardous outside activities and, as one of their responsibilities, keep in touch with their progress for counseling and guidance. This is primarily true for the younger, less experienced people. In the final analysis, however, the experienced pilot is pretty much on his own. He must exercise the good judgment that eliminates, on his part, violations of flying regulations, unauthorized and foolish escapades such as low level acrobatics and flying aircraft that he knows or suspects are unsafe, or flying when he knows he isn't physically fit.

THE I.P.I.S. APPROACH

By the USAF Instrument Pilot Instructor School, (ATC) Randolph AFB, Texas

FUEL REQUIREMENTS (AFM 60-16)

Change 3 to AFM 60-16 has added the *visibility only* criterion to determine field conditions. Since visibility, most often, determines whether the pilot can see the runway environment from DH or MDA, ceiling requirements have been eliminated from everything except for planning fuel required for a particular flight. This has prompted many questions on how to compute fuel requirements during preflight planning. The following is an explanation of present fuel requirements:

To begin, the basic fuel requirement for a flight remains unchanged—". . . must be sufficient to complete the flight to final landing . . . , plus fuel reserve. . . ." The confusion seems to be about how to determine the fuel required when an alternate is required. This can be explained best by considering two situations:

Situation 1: A flight from A to B with C as an alternate. Weather at destination B is 500 feet with ½ mile visibility. Landing minimums are 200-½. Using *ceiling* and *visibility* criteria, the general fuel required, during planning, must equal the time to fly from:

(1) A to B

(2) B to C

(3) Plus fuel for landing at C and fuel reserve.



Situation 2: A flight from A to B with C as an alternate. Weather at destination B is 100 feet with ½ mile visibility. Landing minimums are 200-½. You may file to this destination. Using the *visibility only* criteria, the general fuel required, during planning, must equal the time to fly from:

(1) A to B

(2) B to C

(3) Plus fuel for a landing at C and fuel reserve.

(4) Plus fuel for penetration/approach and missed approach at B (original destination).



The additional fuel requirement in Situation 2 is necessary because, using the visibility only criterion, you may execute a penetration/approach and missed approach at destination B.

RADIO FREQUENCY/RADAR BEACON CHANGE

Q Is there an altitude below which approach control should not assign a radio frequency or radar beacon change?

A Yes. Controllers will not assign departing IFR military turbojet (except transport and cargo type) aircraft a radio frequency or radar beacon change *before* the aircraft reaches 2500 feet. For approaches, controllers will avoid radio frequency and radar beacon changes for turbojet (excluding transport and cargo type) aircraft to the maximum extent that communication capabilities and traffic will permit. Also, they will keep frequency changes to a minimum below 2500'. (Ref FAA Manual 7110.8A.)

POINT TO PONDER
SINGLE FREQUENCY APPROACH (SFA)

For you jocks who fly a single-piloted jet aircraft, there are single frequency approaches available at many airfields. If an airfield has this service, the abbreviation "SFA" will be shown after the heading "Communications" in the IFR Supplement. If you desire an SFA and it is available, we recommend that you specifically request it from the controller.

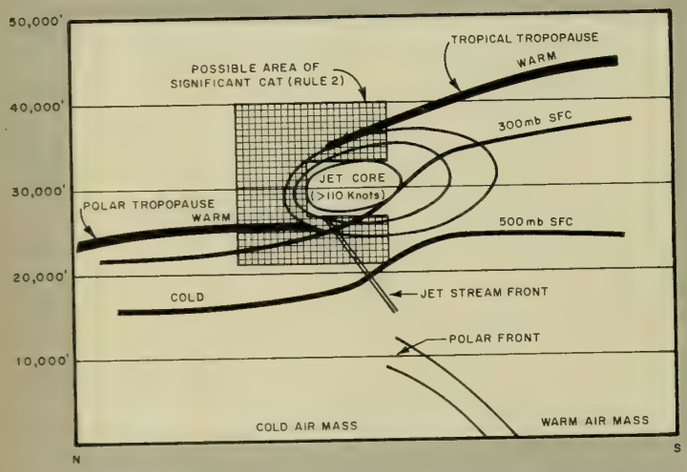
NOTE

ALTHOUGH CIVILIAN AND OTHER MILITARY PILOTS STILL USE SPECIAL VFR (SVFR), HELICOPTER PILOTS ARE THE ONLY *USAF* PILOTS WHO CAN LEGALLY REQUEST SVFR! ★

CAT-RULES OF THUMB

FAA Advisory Circular Nr AC 00-30, 5 March 1970, contained a number of "rules of thumb" to assist pilots in avoiding or minimizing encounters with clear air turbulence. Since not all Air Force pilots would have access to this circular, we asked Air Weather Service for assistance and they obliged with the drawings on these pages. Incidentally, the "rules" are for westerly jet streams.

NOTE: The rules should be considered strictly as rules of thumb and not as a substitute for official AWS turbulence forecasts. Although USAF aircrews receive CAT guidance in preflight briefings, it is felt that these drawings illustrating the textual matter would be of value.



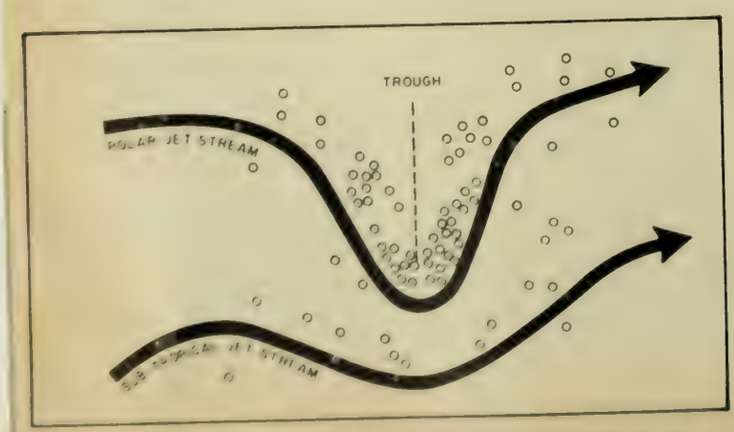
The grid area depicts where you can usually expect turbulence when the wind velocity exceeds 110 knots.

• Jet streams stronger than 110 knots (at the core) are apt to have areas of significant turbulence near them in the sloping tropopause above the core, in the jet stream front below the core, and on the low-pressure side of the core. In these areas there are frequently strong wind shears.

• If jet stream turbulence is encountered with direct tailwinds or headwinds, a change of flight level or course should be initiated since these turbulent areas are elongated with the wind, and are shallow and narrow.

• If jet stream turbulence is encountered in a cross-wind, it is not so important to change course or flight level since the rough areas are narrow across the wind. However, if it is desired to traverse the clear air turbulence area more quickly, either climb or descend after watching the temperature gage for a minute or two. If temperature is rising—climb; if temperature is falling—descend. Application of these rules will prevent following the sloping tropopause or frontal surface and staying in the turbulent area. If the temperature remains constant, the flight is probably close to the level of the core, in which case either climb or descend as convenient.

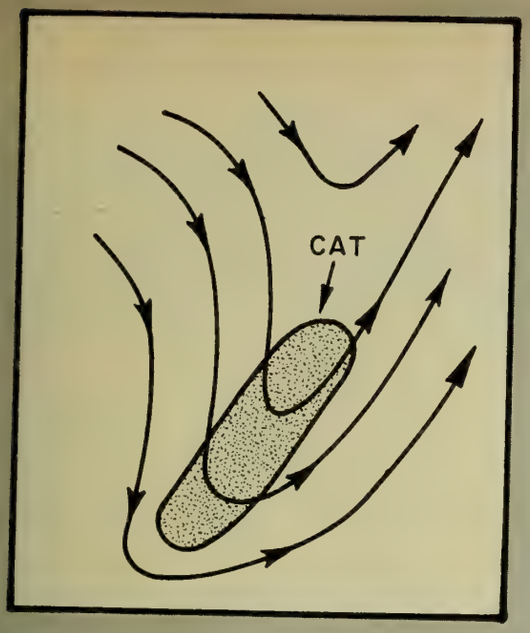
• If turbulence is expected because of penetration of a sloping tropopause, watch the temperature gage. The point of coldest temperature along the flight path will be the tropopause penetration. Turbulence will be most pronounced in the temperature-change zone on the stratospheric (upper) side of the sloping tropopause.



The 20 knot isotachs are one clue to turbulence. On a 300 MB chart if these isotachs are closer than 60 NM apart, expect a rough ride.

• On charts for standard isobaric surfaces, such as 300 millibars, if 20-knot isotachs are spaced closer together than 60 nautical miles, there is sufficient horizontal shear for CAT. This area is normally on the poleward (low-pressure) side of the jet stream axis, but in unusual cases may occur in the equatorial side.

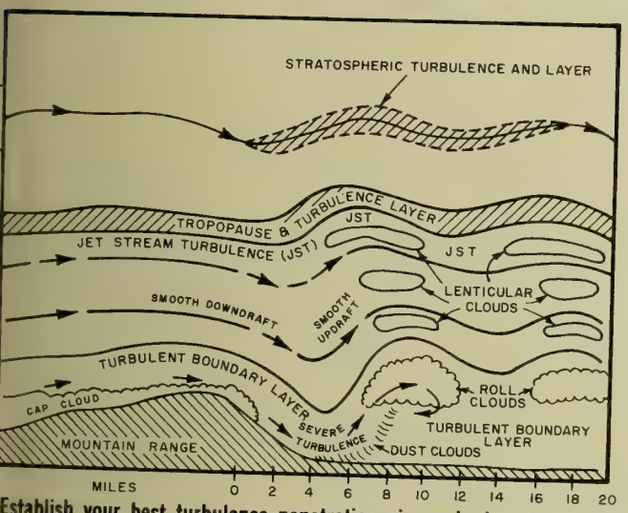
• Curving jet streams are more apt to have turbulent edges than straight ones, especially jet streams which curve around a deep pressure trough.



Your course through a trough such as this should be across rather than parallel to it.

• Wind-shift areas associated with pressure troughs are frequently turbulent. The sharpness of the wind-shift is the important factor. Also, pressure ridge lines sometimes have rough air.

• If turbulence is encountered in an abrupt wind-shift associated with a sharp pressure trough line, establish a course across the trough rather than parallel to it. A change in flight level is not so likely to alleviate the bumpiness as in jet stream turbulence.



Establish your best turbulence penetration airspeed when traveling jet streams flowing in the vicinity of mountains.

• Wind shear and its accompanying clear air turbulence in jet streams is more intense above and to the lee of mountain ranges. For this reason, clear air turbulence should be anticipated whenever the flight path traverses a strong jet stream in the vicinity of mountainous terrain.

• Both vertical and horizontal wind shear are, of course, greatly intensified in mountain wave conditions. Therefore, when the flight path traverses a mountain wave type of flow, it is desirable to fly at turbulence-penetration speed and avoid flight over areas where the terrain drops abruptly, even though there may be no lenticular clouds to identify the condition.

The following two "rules" do not readily lend themselves to illustration.

• Turbulence is also related to vertical shear. From the winds-aloft charts or reports, compute the vertical shear in knots-per-thousand feet. If it is greater than five knots-per-thousand feet, turbulence is likely. Since vertical shear is related to horizontal temperature gradient, the spacing of isotherms on an upper air chart is significant. If the 5°C isotherms are closer together than two degrees of latitude (120 nautical miles), there is usually sufficient vertical shear for turbulence.

• In an area where significant clear air turbulence has been reported or is forecast, it is suggested that the pilot adjust the speed to fly at the recommended rough airspeed on encountering the first ripple, since the intensity of such turbulence may build up rapidly. In areas where moderate or severe CAT is expected, it is desirable to adjust the airspeed prior to the turbulence encounter. ★

METAL FATIGU

Richard J. Pennoni
Directorate of Aerospace Safety

The metals used in our aircraft reflect the state of the metallurgical art. But as strong as they are, those carrying loads can get "tired" from the stresses inherent in flight. We call this metal fatigue. One way to shorten the life of a piece of metal is to provide a point of stress concentration, as this article describes. Once the aircraft is in operation, it is the maintenance people who must look for, detect and correct any such defects. They have the added responsibility of **not creating** *any points of stress concentration.*

This is the first in a series on "things pilots and mechs should know" about aircraft. Next month's article will dwell on aircraft structures—how and to what criteria they are designed—and how pilots can help prolong the life and "structural safety" of an airplane.

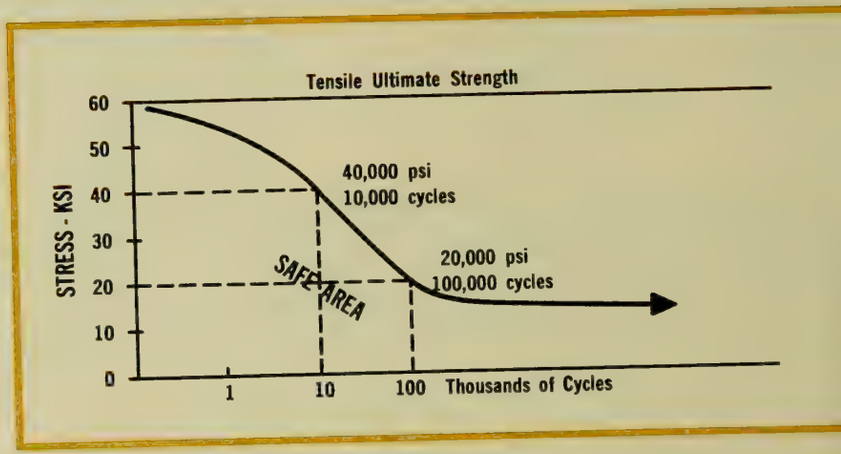


Figure 1 Endurance Limit Curve

Fatigue—for the human body, this word means weary, tired or worn out. In metals, this means a changed or weakened condition after repeated loads. We are interested in both, but this article deals only with metal fatigue.

More precisely, fatigue is the tendency of materials to fracture under many repetitions of stress at levels considerably less than the ultimate static strength. Examples are cracks in wing skins, ribs, stringers and even spars. Or in fuselage skins, stringers, longerons, bulkhead frames and webs.

Fatigue is not limited to the wing and fuselage structure but occurs also in heavy hollow members such as landing gear struts, engine shafts and torque tubes; solid members such as fittings, bell cranks, tie rods, turbine wheels, links, handles and bolts. Fatigue occurs when the endurance limit of the material is exceeded. Endurance limit (for our purpose) is extent of life, or number of cycles of flight loads or stress levels which a part can endure before fracture occurs. As shown in Fig. 1, it is possible for the endurance limit or life to be ten times greater if the stress level is reduced to one half.

Although the life of a part is in
creased by reducing the tensile stre
imposed, this does not elimina
premature and catastrophic failur
if high *localized* stresses are presen
High localized stresses result fro
irregularities of form, such as hole
surface notches or nicks, sha
shoulders and abrupt changes
cross section. These are called *stre
raisers;* the phenomenon is call
stress concentration. Although t
designer and manufacturer strive
avoid these, some aircraft misha
attest to the occurrence of "s
ups."

For example, several years a
we lost a bomber and two of
four-man crew when one wing pa
separated in flight. Investigat
found that the main spar lower c
had a tapered change in section
shown in Fig 2, which containe
sharp vee notch. This apparen
hand-filed notch created sev
stress concentration. The vee no
was contrary to the design draw

N AIRCRAFT...

which specified a ⅜" radius at the base of the tapered cutout.

Here we had a fine example of irregularities in form, namely the notch or stress raiser, and the resulting fracture by metal fatigue. The endurance limit of this section had been drastically reduced. The determination that the filing had been done by unknown personnel after assembly of the aircraft was of no consolation in that this drastic loss could not be undone.

Recently we lost a modern fighter aircraft as the result of a fatigue crack emanating from a small semicircular groove as shown in Fig 3. This airplane had flown less than one-half of its 4000-hour service life established by fatigue tests. It was obvious that even the small area of crack progression discovered was sufficient to induce sudden cleavage of the wing lower plate at flight loads below the ultimate allowable.

What does the Air Force do about these "notch problems?" We issue immediate one-time inspection requirements to detect and rework other defective airframes after one is detected or found during an accident investigation. As stated earlier, this does not undo the initial loss, but it does prevent recurrence and it does alert operational and maintenance personnel to this type of defect. The maintenance man, especially, can render outstanding service. For example, in the two cases cited above, an inquisitive inspector type of individual who kept looking

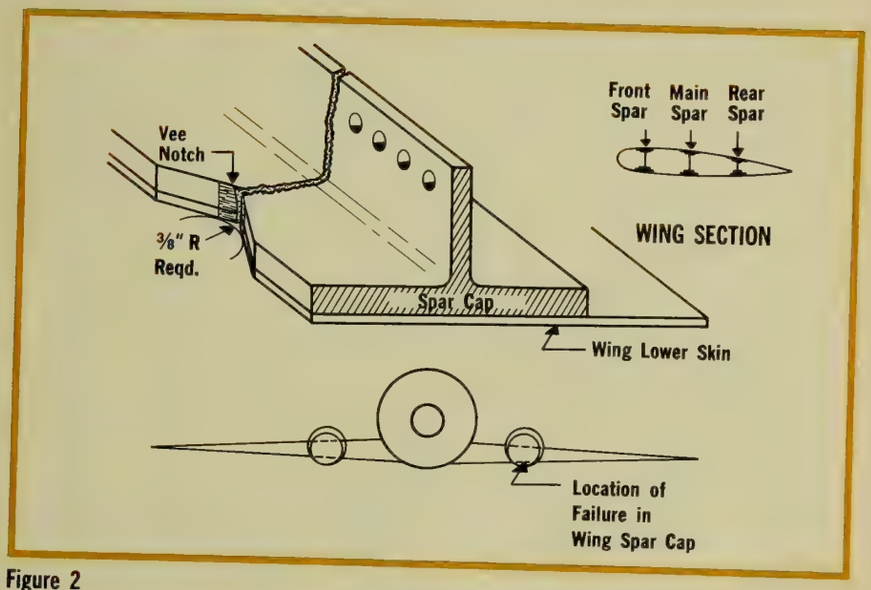


Figure 2

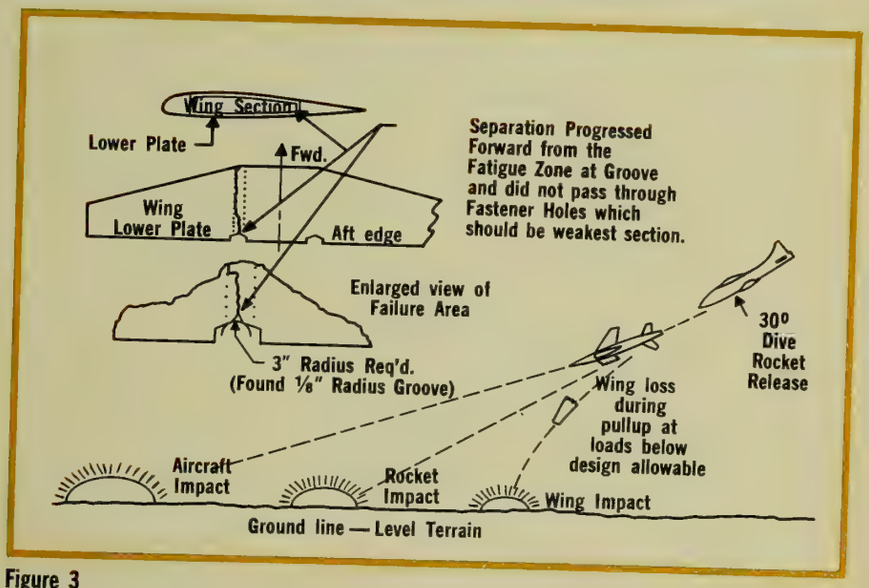
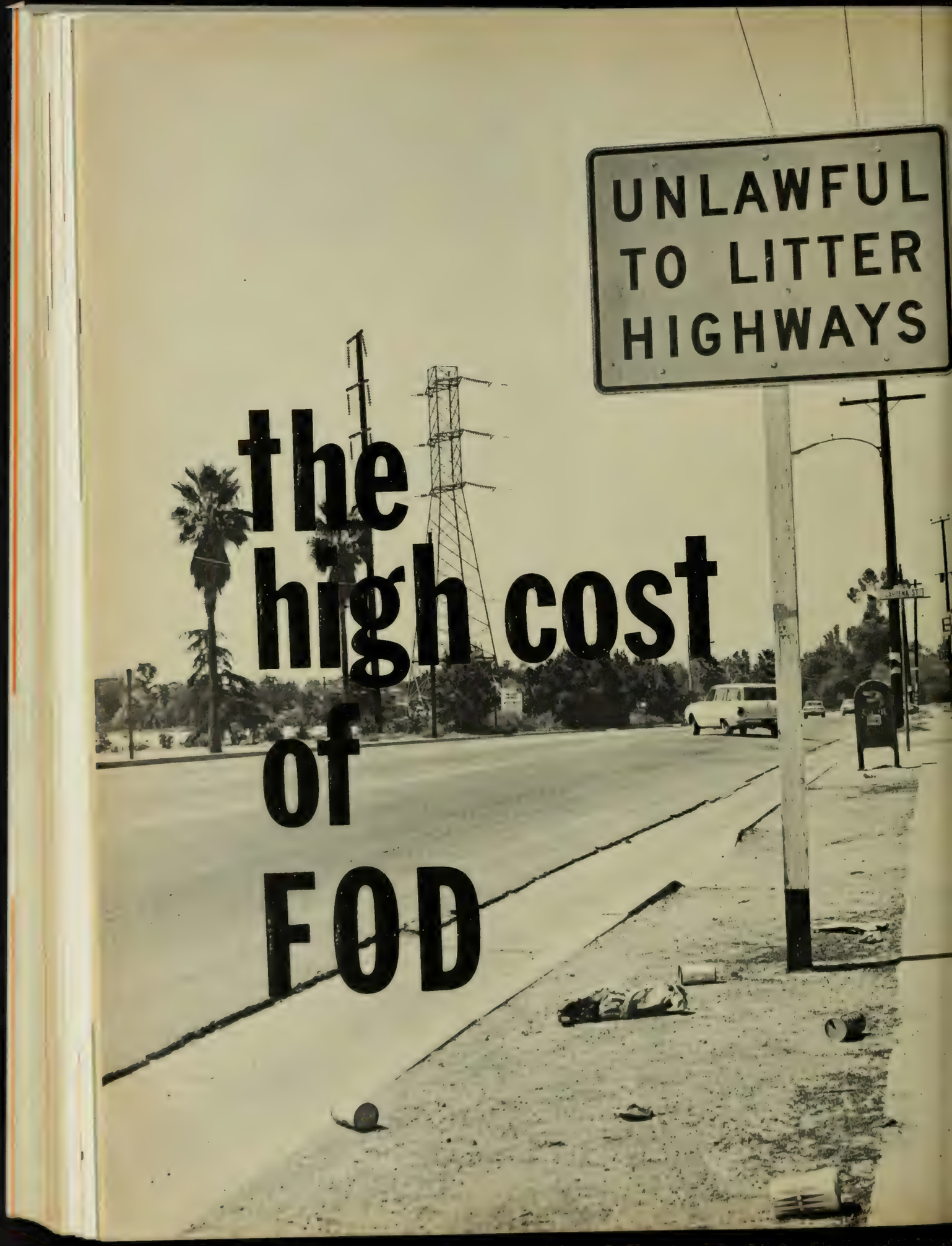


Figure 3

at all of his wing primary structure and who knew what to look for might have detected the notches in time to prevent these catastrophic failures. Also it must be remembered that the wing lower surface components (spar caps, stringers and skin or thick plate covering) are critical in tension throughout the life of the airplane. ★



the high cost of FOD

In California one can be fined as much as $500 for littering. What about the litter that results in FOD?

Ever notice the difference in the amount of trash on an Air Force base versus the community at large? The kind of trash that people thoughtlessly discard along streets and highways, a bit at a time. Maybe you're a little careless yourself occasionally, like the paper cup that misses the trash container at a drive-in. Do you always pick it up?

Perhaps you do, but not everybody does. And if you are as neat and appreciative of cleanliness as most Air Force people, you are appalled at some of the messes you see. But we have some of our own, although they aren't always as obvious. When the wrong item gets into our equipment we call it a foreign object. The damage it does we designate as FOD.

We're all familiar with the term. Most of us are reasonably careful about discarding unwanted items on or off the flight line. Then how come FOD costs us many millions of dollars in damaged and destroyed equipment?

Perhaps the answer lies in size. A foreign object need not be large to cause a malfunction. A short time ago a ¾" piece of safety wire fouled up a fuel shut off valve when it got positioned across two electrical terminals. The engine flamed out and could not be restarted in flight. Fortunately, the aircraft had one good engine remaining and the crew got it down okay.

Loss of an engine at a critical point on takeoff can be, and frequently has been, catastrophic. Why do engines fail at such crucial times? Well, one did because there was a piece of cheesecloth in the left engine fuel strainer on a C-47. That 2 x 14 inch rag could have cost several crewmen their lives. Think about that next time you're tempted to leave such items lying around when you're working on an aircraft.

As we said, size doesn't mean much. Like David taking Goliath, a ⅝" washer went through the jet engine on an F-4, damaging it so badly that it had to be overhauled.

A nut, a small piece of cloth, and a bit of wire. They wouldn't even be noticed among the beer cans and other debris alongside any highway. But they were pretty big stuff when it came to grounding three airplanes.

Think about that! ★





WINTER AIRCRAFT OPERATION

MAJ OSCAR UNSER, 343 FIGHTER GROUP
DULUTH INTERNATIONAL AIRPORT, MN

Back in July when it was 120+ on the Mojave desert and sweat poured in salty streams down our sunglasses, we were trying to think *cool*. Like in this business we have to always be thinking two to three months ahead. So we magazine types are thinking November in August.

To get ourselves in the right frame of mind and to provide some timely stuff for these pages, we queried an acquaintance who spends his winters where the snow is up to his—well, pretty deep. So, these gems that you should find useful are from Major Oscar Unser, Chief of Safety for the 343 Fighter Group, ADC, Duluth International Airport.

He wisely warns that these tips do not represent policy, but are meant to acquaint each aircrew member with problems associated with winter operation. They are in addition to, not in lieu of, info contained in your Dash One.

We hope they will aid you in cold weather. If you find a method here that works for you, use it. If you know some other tip that has helped you, don't be the only person who knows about it. Send it to us and we'll pass it on.

GENERAL

DON'T TOUCH COLD METAL WITH BARE HANDS. (Ever touch your tongue to a frozen ice tray?)

KEEP YOUR MASK INSIDE WHERE IT IS WARM. *Never* leave it outside in the cold where the valves will freeze.)

Carry your helmet out to the airplane in a helmet bag and leave it in the bag until you are ready to put



it on. This will help prevent mask problems (i.e., stuck valves) and cracked hardshells.

When you put on your helmet, put the oxygen mask on and start breathing. This will keep moisture from condensing on the valve and freezing.

When your hands are full and you're wearing a parachute, you are set up for a nasty spill. Your weight is not distributed evenly; you are "back heavy." ADD SNOW OR ICE FOR THE CLINCHER. Take it much slower than usual.

FROSTBITE HURTS . . . AVOID IT!!! Cover vulnerable areas of your body. No matter how warm you feel inside, your fingers, nose or ears can get frostbitten. Remember, temperatures below 32 degrees F are conducive to frostbite.

If you wear the felt winter boots, BE CAREFUL. No heels on ice is asking for a tumble. A BUSTED LIMB IS NO WAY TO SPEND THE WINTER.

Winter operations require more time than summer operations. GET AN EARLY START TO THE AIRCRAFT, so you can walk slowly; give the aircraft plenty of time to warm up; take your time taxiing.

When it is cold outside, there is a tendency to hurry the preflight. DO NOT HURRY the preflight. You might overlook some important item. The key to a quick thorough preflight is to know what to look for on the required preflight items.

Make sure all snow, ice and frost are removed from the aircraft.

Once in the aircraft with the lid down, remember the crew chief—IT IS COLD OUTSIDE. Perform all required checks in a safe and efficient manner. NEVER sacrifice safety for speed; however, it is important to avoid delays in making checks so the ground personnel can get inside where it is warm.

TAXIING ON ICE IS DANGEROUS. If you cannot taxi safely, SHUT IT DOWN AND TOW IT IN!!! Use idle thrust and taxi at a speed that is so slow you could beat the aircraft if you were crawling on your hands and knees . . . EVEN THIS SPEED MAY BE TOO FAST!

Turns are dangerous when runways/taxiways are wet or covered with ice and/or snow. Stop the aircraft before making the turn, then proceed, S-L-O-W-L-Y.

Another dangerous area for taxiing is a downhill slope. USE EX-

TREME CAUTION. If the brakes won't stop you maybe some solid object will.

Make sure there is enough space to taxi without dragging wing tanks/tip tanks in snow drifts. WHEN IN DOUBT, SHUT IT DOWN AND TOW IT.

DEPTH PERCEPTION IN SNOW-COVERED APPROACH ZONES IS POOR. There are no *rules of thumb* or easy *trick methods*. Each pilot must find his own best method. Be aware of the problem and be prepared! ! ! Use available visual or electronic glide slopes!

While snow is falling even taxiing is difficult due to loss of depth perception. SLOW DOWN.

TACAN and ILS antennas are susceptible to heavy snow. A heavy snow squall can knock out these navaids within a half hour.

Compute landing distance BEFORE touchdown. DON'T GET CAUGHT SHORT! !

DRESSING FOR COLD WEATHER

Consult the Chill Temperature Chart on this page. Here is a rule of thumb: for each mph of wind, subtract two degrees of temperature. (i.e., if the temp is −20 F and the wind is blowing at 20 mph, the equivalent wind chill factor would be about −60 F actually −67).

When selecting clothing:

- Dead air space makes insulation. More layers of clothing, more insulation. Several layers of clothing are better than one bulky thick layer.
- Neck should be covered with a loose fitting scarf or turtle neck sweater.
- Heat escapes from the openings at wrist, neck, ankles and waist. Make sure these areas are protected.
- Loose fitting winter gloves provide more warmth than skin tight gloves.
- Your feet stay warmer if you wear a pair of light cotton socks under a pair of wool socks.
- Elastic around your ankles cuts off blood circulation.

FOR GOOD HEALTH

Wear a head protection device AT ALL TIMES.

Regulation of body temperature is most important. When coming inside from the cold, loosen or remove garments to control body temperature. Avoid sweating, this dissipates body heat.

Inspect clothing daily for rips, tears, worn spots and dirt.

COLD can be deceptive—it may look warm outside, or even feel warm but always dress accordingly — FOR THE WORST CONDITIONS YOU EXPECT TO ENCOUNTER.

C-O-L-D WEATHER KEY

Clean clothes give best insulation.

Overheating is like overeating—AVOID IT. Adjust clothing or remove excess clothing to avoid sweating.

Loose clothing in layers gives maximum still-airspace and more insulation.

Dry clothes are warmer.

OUR WINTER CLOTHING REQUIREMENTS

Heavy woolen cap with ear flaps. (Knitted wool face guard and head covering are in the survival kits.)

MA-1 flying jacket or equivalent.

Winter flying suit.

Leather gloves with wool inserts.

Thermal/quilted underwear (maybe both).

Heavy socks.

Flying boots (winter, thermal, bunny, felt, etc.). ★

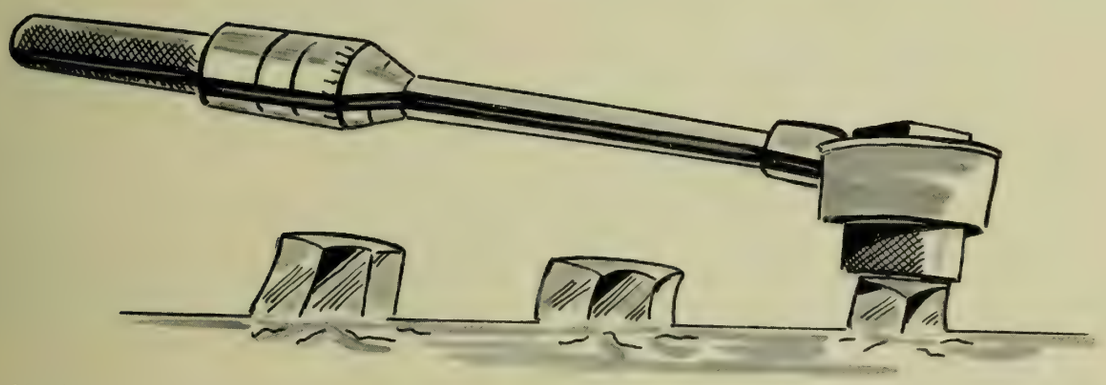
WIND CHILL CHART

Est. wind speed in mph	Actual Thermometer Reading (F.)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	EQUIVALENT TEMPERATURE (F.)											
calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-21	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-36	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-124
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-49	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
(wind speeds greater than 40 mph have little additional effect.)	LITTLE DANGER (for properly clothed person)				INCREASING DANGER				GREAT DANGER			
	Danger of freezing exposed flesh											

INSTRUCTIONS: Measure temperature and wind speed, if possible; if not possible, estimate. Find the applicable wind speed in the left-hand column and the temperature in the top row. Where the two intersect, you'll find the equivalent chill temperature—that is, the temperature that would cause the same rate of cooling under calm conditions.

POOR TORQUING

ARE YOU ONE OF THE 10%?



The old adage, "As tight as you can get it plus one turn" won't do the job any more. Of course, it never did, but in looking over some accident reports, one wonders if that isn't the method some mechanics are using to torque fasteners. In other cases, however, the indications are that no torque method was used at all. Fasteners were left loose or not even connected.

A review of maintenance-caused accidents over the past three years indicates that at least ten per cent were caused by under- or over-torquing of all types of fasteners including "B" nuts on fuel, oil, hydraulic and air conditioning lines. Just about every fastener you can find on an airplane has been at one time either over- or under-torqued.

However, it seems that in most cases where a group of nuts are massed together, they do receive proper torque attention. Cases in point are where the turbine and combustion chambers meet on jet engines, or where a cylinder mates to the case on a reciprocating engine. Of more than one thousand accidents and incidents reviewed, there was only one case each of recip and jet engine case nuts improperly torqued. Even these are too many. But it seems that far more emphasis is being placed on torquing these items than is being placed on torquing "B" nuts and other miscellaneous type fasteners. This may be because of the emphasis placed during training on the necessity for torquing groups of nuts. It may be, too, that some individuals are just too lazy to go to the trouble of getting a torque wrench for just one fastener.

Who is the individual not properly torquing said fitting or nut? The answer is it happens right down the line, from depot to the flightline mechanic.

Supervisors at all levels must continuously monitor their shop practices to insure that proper emphasis is being placed on torque values. Also take a look at TO 32B14-3-1-101. What method of verifying the torque wrench calibration are you using? The question is in reference to TO 32B14-3-1-101, paragraph 1-3.

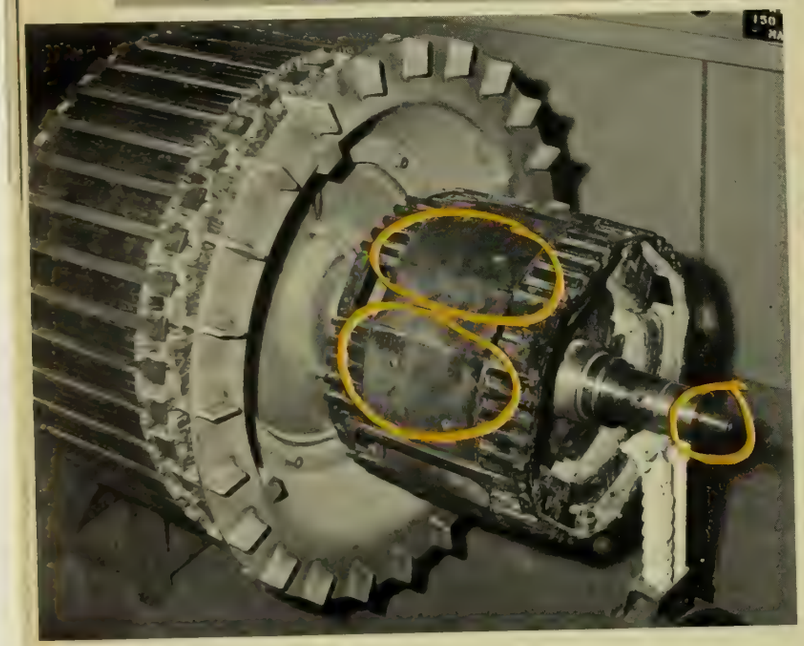
Every fastener that has a specified torque value must be torqued using an authorized torque wrench. (Not by forearm feel or inches of biceps bulge. Everyone's biceps may not bulge the same.)

SUPERVISORS, see to it that torque wrenches are available and used.

MECHANICS, check the wrench for proper calibration before use. And be sure you use it properly. ★



When you submit a QUMR you want action, so give the people who can help you all the ammunition they need, including photos, because they are saying







Air Force photographers always make the scene of each major accident. Their job is to record evidence, such as skid marks and oil slicks, that cannot be packaged and shipped.

Gun cameras and photo reconnaissance aircraft verify the pilot's report of combat results. Photographs also show a wealth of information the pilot would have missed.

When the challenge is to "sh
me," the cheapest and most eff
tive answer is often a photogra

When a quality control man,
vestigating a Quality Unsatisfact
Materiel Report, tells a contrac
that some item wasn't up to requi
ments, the immediate challenge
"That was O.K. when we shipp
it! Show me!"

TO 00-35D-54 encourages
to submit photographs with Qua

SHOW ME!

James H. Smith, SAAMA, Kelly AFB, Texas

Unsatisfactory Materiel Reports (QUMRs, DD Forms 1686). But almost nobody bothers. We checked a couple of hundred recent QUMRs and found only half a dozen backed up with photographs. Some defects won't show on a photograph; but do 95 per cent of them fall into this category?

On a full third of the QUMRs we receive, there's a mistake in the address block at the top of the form. Even if the rest of the report is perfect, the exhibit may be turned in before a misaddressed report can be forwarded and processed. Without an exhibit, with erroneous, sometimes contradictory information on the report, photographs can be your ace in the hole to get effective action to correct the problem.

Unless you give the quality control people enough information to explain the defect, *plus enough evidence to prove it,* you are probably wasting your time and theirs by submitting your report!

The contractor or Specialized Repair Activity (SRA) will respond to your QUMR in about the same way you would respond to an unfavorable comment about the quality of your work.

Any condition worth the time and effort you spend on a QUMR deserves action, and is worth a few photographs to support that action. Consider the following response:

"(Contractor's company letterhead)

July 9, 1970

Gentlemen:

Subject report was received on 7 July 1970. Review of shop files and the data provided by the report indicate that a repair of the shaft stem was accomplished along with other work. While this repair was considered adequate, the report clearly substantiates that the shaft stem repair was inadequate.

Request the exhibit be returned for repair at no cost to the Government . . . etc."

The QUMR that received this two-day response was supported by a couple of photographs. Could a few pictures improve the replies to your QUMRs this much? Why not find out with your next QUMR?

If the base photo lab is swamped when you need pictures, don't let that stop you. There is at least one amateur photographer in your unit. If it shows the defect, any snapshot will do.

When your QUMR, with pictures, is ready to mail remember: the mail symbol for the Quality and Reliability Assurance Branch at each Air Materiel Area has been changed from "NMQ" to "MMQ," The symbols are now SAAMA (MMMQ), OCAMA (MMMQ), WRAMA (MMMQ), OOAMA (MMMQ), and SMAMA (MMMQ). ★

CHECKLIST FOR PHOTOGRAPHS

1. Is the photograph clearly identified, so it can be matched with the report after they become separated?

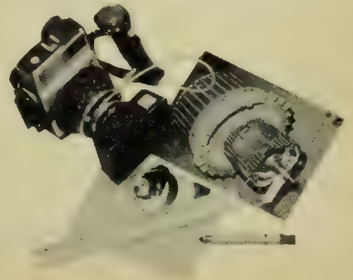
2. Is there something in the photograph, such as a ruler or a man's hand, to show size?

3. Is the defect pointed out? Paper arrows taped to the exhibit, or a pencil pointing to the defect, are two methods.

4. Is the serviceable tag, the inspector's stamp, and the contractor or SRA decal shown? Are they legible? If they won't show in your photograph, how about making copies on your office copying machine?

5. Did you send two copies (one for our file, one for action)?

6. Would the defect show better in color? Some problems, such as corrosion, show much better in color. HINT: Try using brown paper with large type for tags and arrows taped to the exhibit. White paper is much brighter than most exhibits, and the exhibit may be under-exposed while white tags are over-exposed.



Nondestructive Inspection (NDI) has become an extremely important maintenance tool. While NDI is not limited to any one command, this article describes some of its applications in Air Training Command.



NDI-MURPHY'S NEMESIS

Capt Elee W. Tyler, ATC (ATMME-AX), Randolph AFB, Texas

Anyone who has spent time around a flight line is familiar with "Murphy's Law"—"If there is any possible way to goof, someone will." This so-called law is not one of the laws of science, but seems an almost invariable rule of human nature.

This Murphy character is all too well known to every technical writer and every maintenance supervisor. He is like "Kilroy" of World War II —here, there and everywhere. But instead of writing on walls, Murphy does such things as installing bolts upside down, clamps backwards, and crossing connections.

Constant vigilance and dedicated workers have greatly reduced and kept Murphy's goofs to an all-time low; nevertheless, the continuing increase in diversity and complexity of our aircraft have created more and more chances for mistakes.

These opportunities for errors become more evident when we recall that most maintenance inspections follow a disassemble-inspect-reassemble process. It simply means that the more something is taken apart, the greater the risk someone will put it together wrong.

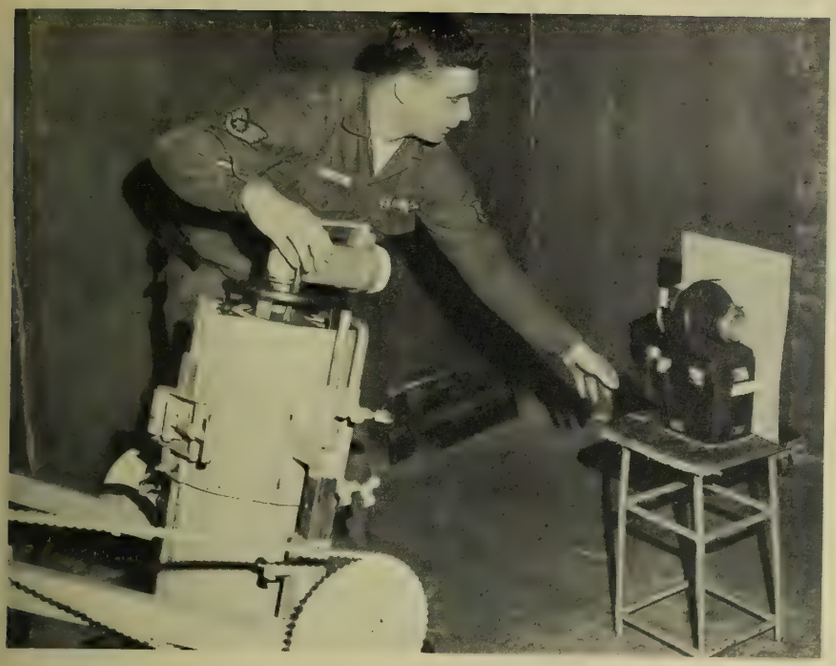
How can we beat the law? Obviously, if we quit taking things apart we will eliminate many errors, but you and I know it is better to check equipment periodically than to wait for a catastrophe.

So how can the periodic inspections be accomplished without the disassemble-inspect-reassemble sequence which takes time, extra parts, man-hours and extra toll in the life of the system?

Air Training Command (ATC) is now using a loophole in Murphy's Law to great advantage. It is called Nondestructive Inspection (NDI) which is proving more effective all the way around in comparison with the old method. Instead of a tool box and eyeballs, the command now employs x-ray and ultrasonics and several other types of equipment. Industrial x-ray units, which can shoot through several inches of steel, are being used to examine aircraft structures.

Ultrasonic units, which put sou into an object and then monitor t echo, help find flaws in a casting corrosion under a screw. Some f miliar types of equipment have be made smaller and handier by usi transistors. This is especially t for magnetic particle equipme some of the latest and most pow ful units can now be held in on hands.

NDI is essentially a new and b



The hoist is being lowered to the proper angle to X-ray the wing section and horizontal stabilizer of a T-37 aircraft.



Proper alignment is made of a Sperry 275 X-ray tube prior to photographing a T-37 heat exchanger for faulty parts.

The non-destructive inspection technician measures the distance between a Sperry 275 X-ray tube and a T-37 heat exchanger, prior to radiation exposure to determine the defect.

ter way to do the same old job. It is simpler, faster, and allows for work to be scheduled as needed. A prime example of the value of the new method was the experience with the forward canopy of the T-38 Talon jet trainers used by ATC.

The command had several incidents where the forward canopy blew off in flight. It was discovered that the canopy was ripping because the fiberglass nodes were cracking and retaining pin bushings were slipping. With the possibility of canopies "unzipping" from the frame, it became very important to know which aircraft were pending failures.

The only inspection method known at the time was a disassembly and visual inspection of the canopy. The job required 33 man hours, plus 48 hours of sealant cure time after completion.

From an operational point of view, it required four days before the aircraft could be flown again.

A team of technicians was given the go sign to test and verify an x-ray procedure technique. The results were so favorable that the procedures were incorporated into a time compliance technical order.

The inspection they developed could be accomplished by two men in one and one-half hours per aircraft. It required no canopy removal and no disassembly. In fact, a fleet wide inspection revealed that one canopy, which had previously been visually inspected, had been damaged during reassembly. Murphy had struck again!

Another example of NDI effectiveness is revealed by the current inspection program for the T-37 aircraft. The periodic maintenance interval is now 800 hours, compared to the original 400 hours.

This was accomplished by ATC conducting an engineering study of the aircraft and its own NDI research project. By the end of the project, so many NDI applications had been developed that complete changes in work sequence and job responsibility were required. The end result was a more thorough inspection and 100-man-hours less time per inspection. Most important, however, the results of the NDIs of critical areas were used as the basis for approving the 800 hour PE cycle, which, in terms of man-hours, will save the command nearly one half million dollars annually.

What about Murphy, is he beginning to age and become less active? During the project the command found the unscheduled maintenance workload dropped some 20 per cent. Maybe Murphy was not the cause of that 20 per cent extra work, but because of NDI he had less chance to foul up the aircraft.

Anyway, ATC believes it has found a loophole in Murphy's law and intends to use it to the fullest extent possible. ★



TOOTS

is interested in your problems.
She spends her time
researching questions about Tech Orders
and directives.
Write her c/o Editor (IGDSEA),
Dep IG for Insp & Safety,
Norton AFB CA 92409

Dear Toots

It has been Air Force policy for years to instill in the maintenance man to "follow tech orders." However, during the daily grind of launch, recovery, return to OR status and launch again, we may tend to deviate from technical data. I doubt seriously if even a handful of maintenance people could certify that they follow technical data to the letter in every applicable operation they perform. If one does, he is one in a thousand because if he makes even an error in aircraft form maintenance, he has violated a technical order.

In order to whittle down the lip service I would like to submit the Introduction Step of our lesson plan that is used in the Aircraft Maintenance Officer Course at Chanute when technical orders are presented. Quite long, but here goes!

Have you ever taken your car to a garage for maintenance and wondered why the mechanic did not use a technical manual to perform maintenance "by the book?" It is possible for you to enter a garage and watch several types of cars pass through various stages of maintenance and not one mechanic will consult a technical manual for information. Why? Either he has read all of the manuals before and "remembers" all of the material or he "hits and misses." Well, this type maintenance doesn't do your car any good and only adds to your expense when faulty maintenance contributes to a subsequent failure. Did you ever order a part for your car and, after waiting a week for it, discover it doesn't fit? These incidents often occur. Some feel it is lack of management. Some feel it is lack of training, and some feel the employees couldn't care less.

In the Air Force, we have been provided with the most adequate, accurate and elaborate technical manuals that could possibly be published. They have been distributed for use, and violation in not using them could result in strong disciplinary measures. After all, they are *military* orders. Many people do not realize this, and some have paid out of their pocket for failing to follow a maintenance procedure by wearing fewer stripes today or having their careers terminated earlier than expected. Being able to follow procedures properly or to order the right part for the right aircraft is a serious thing! We would be in sad shape if we tolerated people who damaged or destroyed costly equipment because they failed to follow procedures. We must train, manage and supervise our subordinates to assure compliance with technical publications.

Approximately 75,000 publications exist in the Air Force technical order system! It would stagger the imagination if we tried to figure the cost of research, printing, storing, distributing, and up-dating the publications. Further, if we took one copy of each publication and placed the mass on scales, what would be the total weight? Considering the cost and volume investment of the technical order inventory, it is imperative that managers and supervisors assure adequate use of the publications and not let them gather dust in a cabinet. We must perform only high quality maintenance. We must not be negligent since costly equipment and lives of air/ground crews are involved. We are in a serious business, so we must be serious! !

James D. Vanhook (SMSgt, Ret)
Chanute AFB IL

Everyone associated with aircraft maintenance can benefit from this message. Our thanks to SMSgt Vanhook!

Toots

REX RILEY'S CROSS COUNTRY NOTES

I recently heard about a situation that fortunately terminated with an incident instead of an accident. Two fighters on a routine cross-country were cleared by Approach Control from FL 250 to 3000′ in preparation for landing. Weather was day VFR. At 10 miles and 3000′, Approach Control called and advised the flight that the base was closed, would remain closed for approximately one hour and that the flight was to hold. The pilot refused and asked for an immediate clearance to a nearby base since the fuel remaining was about 2300 pounds. The clearance came through as requested and both aircraft landed safely at their new destination with 900 pounds of fuel.

Let's take a close look at this incident. First of all, the cause of the whole Alphonse and Gaston act was the balloon on the Fulton Recovery System. The local rescue folks had one inflated on the north end of the field in preparation for recovery. In reality this did not really constitute a hazard unless an aircraft had to execute a missed approach. In which case, forewarned and preplanned, the flight, approaching from the south, could have avoided the balloon.

Who, if anyone, told the approach facility to "close the runway?" Shutting down a patch of concrete is a big operation and certainly not to be done without much planning. The Air Force has a neat little system called NOTAMs designed to get the word out quickly. In this instance, a NOTAM had not been transmitted since it appears the closing of the runway was on the spur of the moment. As an ex-ops type, when I hear "Runway Closed" my first questions are "Why? For how long? Whom do we have up" and, if anybody, "what's his fuel state? Is the strip open for emergency landing or do we have a bird broke halfway down the runway?"

Runway closure is an eyebrow raiser in anybody's language and should be accompanied by answers to the above questions. Such was not true in this case. In every instance *all* agencies involved should get as much information as possible to avoid what happened to these two fighters. Had the weather been marginal, then the end of this story might not have been so uneventful as a hacked-off pilot or two.

This is the second such case of no-notice runway closure in the past three months (that Rex is aware of). The first one was with yours truly on five mile final. Fortunately the weather was good but it still points to a lack of professionalism on the part of all involved when those responsible for such action were aware of the closure days in advance but failed to publish a NOTAM to warn the pilots. Nor do I think "Runway Closed" is a good term to apply *unless* there is something that would absolutely preclude a landing (such as a wrecked airplane on the *only* runway). PPR seems to be a much better term.

I've never seen an air show yet that couldn't be broken off or delayed to get a crippled or minimum fuel aircraft on the deck. Let's try to be a bit more discrete in our treatment of the terms we use and ask the question, "Is the strip *really* closed," or do we mean we'd "Rather you go somewhere else during this period, but if you *need* the runway you're welcome." ★



REX RILEY
Transient Services Award

LORING AFB	Limestone, Me.
McCLELLAN AFB	Sacramento, Calif.
MAXWELL AFB	Montgomery, Ala.
HAMILTON AFB	Ignacio, Calif.
SCOTT AFB	Belleville, Ill.
RAMEY AFB	Puerto Rico
McCHORD AFB	Tacoma, Wash.
MYRTLE BEACH AFB	Myrtle Beach, S.C.
EGLIN AFB	Valparaiso, Fla.
FORBES AFB	Topeka, Kans.
MATHER AFB	Sacramento, Calif.
LAJES FIELD	Azores
SHEPPARD AFB	Wichita Falls, Tex.
MARCH AFB	Riverside, Calif.
GRISSOM AFB	Peru, Ind.
PERRIN AFB	Sherman, Tex.
CANNON AFB	Clovis, N.M.
HICKAM AFB	Hawaii
LUKE AFB	Phoenix, Ariz.
RANDOLPH AFB	San Antonio, Tex.
ROBINS AFB	Warner Robins, Ga.
TINKER AFB	Oklahoma City, Okla.
WETHERSFIELD AFB	England
HILL AFB	Ogden, Utah
YOKOTA AB	Japan
SEYMOUR JOHNSON AFB	Goldsboro, N.C.
ENGLAND AFB	Alexandria, La.
MISAWA AB	Japan
KADENA AB	Okinawa
ELMENDORF AFB	Alaska
PETERSON FIELD	Colorado Springs, Colo
RAMSTEIN AB	Germany
SHAW AFB	Sumter, S.C.
WRIGHT-PATTERSON AFB	Dayton, Ohio
LITTLE ROCK AFB	Jacksonville, Ark.
TORREJON AB	Spain
TYNDALL AFB	Panama City, Fla.
OFFUTT AFB	Omaha, Nebr.
ITAZUKE AB	Japan
ANDREWS AFB	Washington, D.C.
McCONNELL AFB	Wichita, Kans.
NORTON AFB	San Bernardino, Calif.
BARKSDALE AFB	Shreveport, La.
HOMESTEAD AFB	Homestead, Fla.
CHANUTE AFB	Rantoul, Ill.
KIRTLAND AFB	Albuquerque, N.M.

Ops topics

AN OLD ADAGE

Despite most pilots' familiarity with their cockpit controls, recent experience reiterates the need to heed that oft-repeated advice, "Look before you leap."

• UH-1F instructor reached across the center console to turn off the hydraulic console switch for the purpose of giving his student a hydraulic boost-off landing. Instead he turned off the main fuel switch, the engine flamed out and the IP demonstrated a power-off landing. Undoubtedly *both* the IP and the student learned from this one.

• As the F-100 rolled out on downwind the pilot lowered the gear without looking at the handle. The gear went down—and so did both external tanks and all the pylons. Apparently he got the emergency jettison system along with the gear handle.



READY FOR SOLO?

In two recent incidents solo students got themselves in trouble on landing and wound up with bent and battered airplanes. Both had been cleared for solo, but—

The first, a Primary student, encountered a light left crosswind (less than three knots at 90 degrees) and started to drift to the right over the end of the runway. He applied power for a go-around but released back pressure and touched down on the nose gear. The airplane immediately veered left, and the student pilot put in right aileron and rudder to correct the situation. The bird smartly responded with a roll to the right and the right wingtip contacted the runway. Then it nosed over, the prop bit into the runway and pilot, prop, airplane and wingtip careened off into the grass.

The second case was a student in an advanced fighter aircraft on a night solo mission. His touchdown was firm enough to cause the airplane to bounce a good way back into the air. He attempted to reestablish a landing flare but the airplane rolled off to the right. When he finally applied power to go around his aft section and right tip contacted the runway. As he lit afterburner to expedite his go-around, the bird rolled back to the left and the left tip dragged the pavement. He eventually managed to right the airplane and get it back in the air. His next landing attempt, from a straight-in approach, was successful.

Both of these incidents were classed as student pilot error. And both pilots were to be given additional dual landing practice with an instructor before being re-cleared solo.

Now comes the question: Were either of them ready for solo when their IPs cleared them? The solo decision is the toughest one an IP must make. He often finds himself pushing the maximum allocated dual time before he is confident of his student's readiness.

One of the many factors influencing the IP's decision —and an important one—should be: "Has this student been exposed to a sufficient number of unusual situations? And has he demonstrated a real ability to cope with them and come away unscathed?"

UNHAPPINESS IS

1. Arriving at your destination without the appropriate letdown book.
2. Experiencing electrical failure at night without a flashlight.
3. Flying with a sinus block and Approach Control tells you to expedite your descent.
4. Walking into Base Ops with the seat pin streamer hanging out of your flight suit pocket.
5. Forgetting to lock the canopy and it departs the aircraft as you depart the pattern.
6. Making a barrier engagement with the throttles in Mil Power.
7. When the formation lead breaks into the echelon.
8. Having a taxi accident while filling out the 781.
9. Having a bird come through the windscreen and not having your visor (or visors) down.

Capt Larabee, ATC

COMPLACENT?

It all began with a ground abort. The pilot then hustled through the preflight of the spare aircraft and caught up with the rest of the flight waiting at the end of the runway. He noticed nothing unusual during ground operation and takeoff, but during the climb he observed with annoyance that the cockpit wasn't cooling off the way it normally did. He dismissed it for the moment, rationalizing that it was just a normal result of his rush and hurry in preparing the spare aircraft. But when the condition persisted, he took off his glove to check airflow at the cockpit air conditioning outlet. He felt no airflow.

Shortly after leveling at FL 240 he experienced hot and cold flashes. Then he found he was having difficulty in responding to radio transmissions. When the physiological symptoms returned, he finally looked at the cabin altimeter—it read 27,000 feet! He informed his wingman, terminated the mission, descended and landed without further incident.

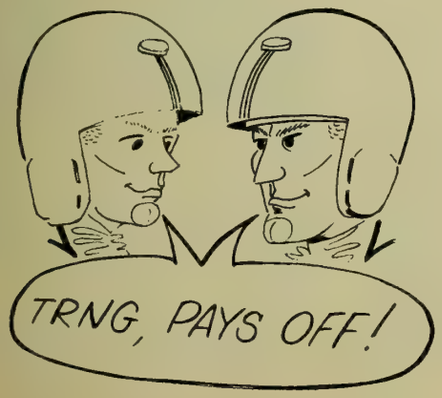
Investigation on the ground revealed a loose clamp on the hose to the inlet side of the water separator. The air conditioning hose to the cockpit had disconnected.

Primary responsibility for this one rests with the maintenance people who left the clamp improperly secured. But the pilot allowed himself to come unnecessarily close to disaster by failing to check cabin altitude during the climb and disregarding the ample evidence available to him that he had a serious problem.

QUOTES TO REMEMBER

. . . "The gear retracted and the IP elected to abort on the belly. The bird flew or slid the full length of 21 right and then inadvertently caught the BAK-9. He pulled out 200 feet of cable, stopped and caught fire. Both crewmembers made a ground-level egress and they were uninjured. A big point here for that "unnecessary" ground training we go through: We don't like egress training, but here are two guys who made it pay off."

(Minutes of 58 TFTW FSO Meeting)





HOW HIGH?

The photo above tells the story but here are a few details. In a formation climb out from Wethersfield the RF-4 aircraft commander misread his pressure altimeter by 10,000′. Below the viewfinder is a screw-on cap with a safety chain attached. This chain was hanging down in front of the ten thousand digit obscuring it. He thought he was at 3400′ when, in fact, he was at 13,400′. The photograph was taken from the pilot's normal position.

RF-4C units should inspect the length of these chains and shorten those that could mask any numbers.

Tech topics

briefs for maintenance techs

colored smoke grenades

A STUDY of colored smoke grenades has indicated that the smoke produced is of low toxic level and should present no noticeable problems unless inhaled in heavy concentrations. Accordingly, these grenades have been reclassified from Hazard Classification Group A (Chemical Munition Group D) to Group N—Pyrotechnics. This change which effects the M18, M22, M22A2, M23 and XM48E1 grenades, will be reflected in the next revision of AFM 127-100 and applicable stock catalogs (FSG 1300).

These grenades are satisfactory for outdoor demonstrations, tests, and marking and signalling. However, they will serve as an ignition source if they are used near combustible material. They should not be used inside buildings because of the inherent fire hazard and the fact they consume oxygen.

White Smoke Grenades HC, AN-M8 and Smoke Pots HC, M1, M5 remain in Hazard Classification Group A (Chemical Group B) due to the presence of zinc compounds in their smoke. The inhalation of zinc fumes in HC smoke has produced metal fume fever or pneumoconiosis. Therefore, use of HC smoke should be limited to outdoors, and anyone entering the smoke should wear a protectiv mask. The HC smoke grenades an smoke pots may also serve as a ignition source for combustibl material.



Robert L. Alg,
Directorate of Aerospace Safe

save a nickel, lose??

AS THE PILOT advanced power on the Nr 1 engine of a T-37 to approximately 80 per cent, he noted severe vibration. He shut it down and made a successful single engine landing. Tear down inspection of the engine revealed a self-locking nut had backed off a stud on the radial diffuser and had passed through the engine, causing extensive damage. It was also determined that the nut had been reused during engine buildup. Review the instructions in TO 1-1A-8 regarding the reuse of self-locking nuts.



aim-9e

THE F-4 dearm crew discovered the area around and on the AIM-9E missile wings blackened. It was determined that during system checkout prior to air intercept, the gas grain generator was activated.

The generator activated because the load crew had neglected to install the umbilical adapter plug (bypass plug), P/N 1554965, between the AIM-9E umbilical and the missile quick disconnect on the aero 3B launcher, as required by TO 1F-4C-33-1-2CL-55. Damage to the missile was such that depot level repair was necessary at a cost of over $2900.00.

The load crew was decertified and an AFTO 22 was submitted to bring the checklist in line with the TO.

cadmium care

CADMIUM-PLATED tools can be a critical safety problem. The mechanic who uses a cadmium-plated wrench or hammer on a titanium part may leave small particles of the cadmium on the titanium. When the part, such as one for an engine, becomes hot, a chemical reaction occurs between the two metals; the titanium becomes brittle and a premature part failure could result. To prevent this possibility, mechanics should use only nickel-plated tools on titanium parts. Nickel-plated tools are embossed "21C" for identification.

J. H. Cates, SMAMA (SMNET)
McClellan AFB, California

ov-10

DURING a functional check flight, an OV-10 pilot shut down Nr 2 engine per the checklist. But he could not get it restarted. A positive check of the condition lever position was made, and it was confirmed to be in the fuel shutoff position and not in the prop feather position, yet the prop had gone to feather. A single engine landing was completed without further difficulty.

Investigation revealed that the condition lever input rod was out of adjustment and that it had not been adjusted properly at the time of engine installation and subsequent runup. The maladjustment was such that when the condition lever was moved to fuel shutoff, it also moved the feather valve to feather position.



Tech topics

CONTINUED



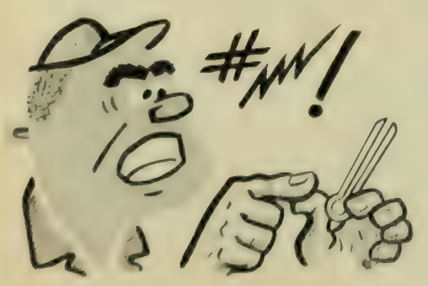
wrinkled wrump

A **TOWING TEAM** was dispatched to remove a B-52 from the maintenance hangar. The hangar doors were partially opened to permit entry of the Euclid. The crew then began preparing the aircraft for towing. At this time, the tail walker and shift supervisor departed the briefing area toward the tail of the aircraft to move the crew Metro and obtain clearance to move the aircraft. The towing supervisor, thinking the tail walker had moved into position, gave the Euclid drive the signal to move out. As th aircraft started to move, the ta struck the tail fin door causing ov $2000.00 worth of damage. Th towing supervisor was charged wi the primary cause factor.

Don't take your duties as towi supervisor lightly. Follow yo checklist and *be sure* the aircraft ready to move before you give t signal.

don't forget the pin

THE F-4 PILOT cruising along at FL 270 noted his Nr 1 rpm decreasing through 65 per cent and the fuel pressure at zero. After two unsuccessful airstart attempts, he landed at the nearest diversion base. Maintenance determined the incident was caused by a bolt coming out of the connection between the torque booster and the fuel control crossover shaft. When the bolt fell out it allowed the fuel control to go to the closed position. The bolt and nut were found in the cowling. It was determined that the cotter pin had not been installed. The individuals involved were either relieved of duty or received a written reprimand.



sloppy work, no qc

A **T-33 PILOT** was mildly surprised when he turned on his rotating beacon and the tip tanks fell off. He diverted to the nearest base and landed.

The aircraft had just undergone a TCTO for installation of a rotating beacon system. A three level electrician had installed the rotating beacon on/off switch and a ten amp circuit breaker. The beacon light wire was soldered in a cannon plug between a warning light circuit and the tip tank jettison circuit. The beacon wire was not completely in its pin hole; it was soldered at an angle and it had excess solder o which made contact with the nea jettison circuit. A five level assig to the job didn't check the th level's work. The shift supervi signed off the red X. The bea light was operationally check however, the tanks did not jetti because ground safety pins w installed.

This incident points out the that you should never sign off a X without personally inspecting phases of the work the red X dition covers.

rig it right

HOW MANY TIMES have you taken your auto to a mechanic, with a specific problem, then paid for repairs that didn't solve the problem? I'm sure you find such incidents upsetting and you vow never to take your auto back to the same mechanic.

The reaction would be considered normal for auto drivers, but what about airplane drivers? Do pilots have a choice of mechanics? Obviously the answer is no. So we maintenance people must strive to give them a good product every time.

A problem that has repeatedly shown its ugly head in the past six months (not repeatedly to the same aircraft, but repeatedly to different aircraft in different parts of the world) is engines flaming out due to improper throttle rigging. There have been more than 20 such incidents with three different types of aircraft—T-38, T-37 and F-4 in the past six months.

The T-38 throttle rigging problems were mostly caused by low cable tension, and in most cases only one engine was affected at a time. However, there was at least one incident where both engines flamed out. The T-37 story reads the same as the T-38—engines flaming out due to improper throttle rig.

The F-4 problem is a little more complicated.

- Teleflex cable and control box worn.
- Cable twisted.
- Teleflex cable unraveled.
- Linkage became disconnected.
- Throttles out of rig.

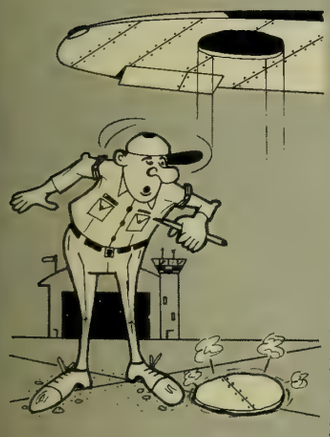
In all of the above cases the aircraft did make safe landings. However, it would seem that now is the hour for supervisors to take a look at their engine trim program, especially the throttle rigging area. Don't give the bird drivers cause to wish they had a choice of mechanics.

aced deuce



WHERE do you store the 781? The Deuce pilot was ready for takeoff and as he ran up the engine there was a massive compressor stall, the engine overtemped and a long sheet of flame belched out of the tail pipe. Fortunately this was before the beginning of takeoff roll and not after liftoff. A recap of the events immediately preceding the pilot's getting into the cockpit disclosed that during preflight the 781 binder was left in the engine intake.

dangerous chemical reactions



FLASHLIGHT batteries are usually made of graphite and zinc. Electricity is generated by chemical reaction between the zinc and the graphite. The same "battery" can be created on your aircraft if you write on aluminum with your graphite pencil. In one case, an inspector drew a pencil line around a crack in an aluminum wing skin. Two months later the crack wasn't a problem because the entire disc fell out. The pencil mark acted as a perfect can opener. Instead of graphite pencils, carry a grease pencil and use it properly.

J. H. Cates, SMAMA
McClellan AFB, CA

sin of omission

DURING a critical phase of flight an HH-3's Nr 2 engine flamed out. After analyzing the situation the pilot determined the engine could be safely restarted and the mission was completed without further incident.

Back at the base Maintenance found the Nr 2 fuel control filter preformed packing, P/N MS 9021-0019, missing. It is believed this allowed contaminated fuel to bypass the filter and enter the fuel control which caused the fuel control to malfunction and the engine to flame out. Of such stuff accidents are made. ★



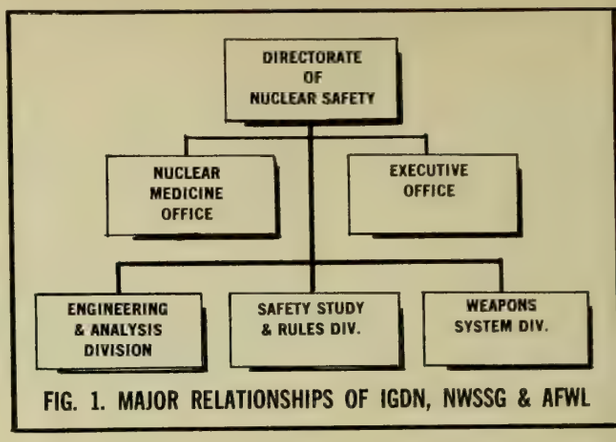


FIG. 1. MAJOR RELATIONSHIPS OF IGDN, NWSSG & AFWL

AIR FORCE NUCLEAR WEAPON SYSTEM SAFETY

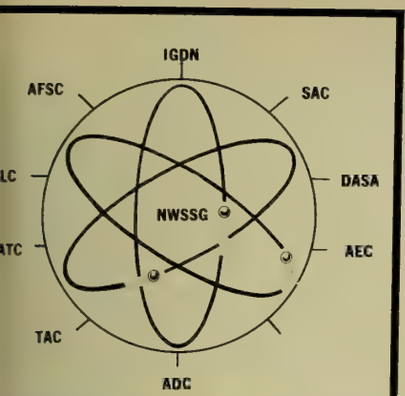
Maj Mitchell B. Riley, Directorate of Nuclear Safety

Nuclear weapon systems play a vital role in this nation's continuing security against outside aggression. Because of their immense destructive capability, it is of paramount importance that these systems be designed inherently safe and be operated in a safe manner. To insure this result, the United States Air Force places great emphasis on two fundamental objectives:

- To prevent an *accidental* detonation of a nuclear weapon.
- To prevent an *unauthorized* detonation of a nuclear weapon.

During 25 years of operations with nuclear weapons, these objectives have been satisfied. To maintain this record, there is a continuing need for dedicated persons to reduce to an absolute minimum the number and consequences of nuclear weapon system accidents, incidents and deficiencies. This end is achieved through the proper application of those design concepts and operational procedures which emphasize nuclear safety.

The responsibility for nuclear safety in the Air Force is broad and ranges from individuals like you to The Inspector General who has overall responsibility for the Air Force Nuclear Safety Program. Right in the midst of this spectrum of responsibility are three organizational entities which are vitally involved in the USAF Nuclear Safety Program. These are the:



G. 2. DIRECTORATE OF NUCLEAR SAFETY

• Air Force Directorate of Nuclear Safety

• Air Force Nuclear Weapon System Safety Group

• Air Force Weapons Laboratory.

These organizations are headquartered at Kirtland AFB, New Mexico, and each plays a specific role in planning for and maintaining nuclear safety in the Air Force nuclear weapon systems. The purpose of this article is to define the responsibilities of these organizations and to explain their relationship to nuclear weapon system safety.

The Inspector General's responsibilities are fulfilled by the Deputy Inspector General for Inspection and Safety, (IGD). Acting for IGD, the Directorate of Nuclear Safety (IGDN) exercises Air Staff supervision over the nuclear safety program. IGDN responsibilities are to:

• Develop and insure prompt and effective implementation of Air Force nuclear safety policies, programs and standards.

• Monitor nuclear weapon systems to determine the adequacy of nuclear safety features.

• Conduct nuclear safety surveys, nuclear weapon system safety studies, inspections and operational reviews and develop safety rules.

• Monitor or conduct nuclear accident/incident/deficiency investigations.

• Provide technical assistance to an on-scene commander regarding the safety aspects of a nuclear weapon system involved in an accident.

• Provide the chairmanship and supervise the activities of the Nuclear Weapon System Safety Group (NWSSG).

• Provide the secretariat for the NWSSG.

• Formulate the Air Staff position on proposed safety rules and provide official interpretation of safety rules.

• Develop and act as the OPR for Air Force nuclear safety regulations.

The Directorate of Nuclear Safety, under the leadership of Colonel Britt S. May, reviews, inspects, and takes necessary action on issues affecting Air Force nuclear safety on a world-wide basis. IGDN is organized into three divisions: the Engineering and Analysis Division, the Safety Study and Rules Division, and the Weapons Systems Division. The Nuclear Medicine Office and the Executive Office complete the organization. (Figure 1)

The NWSSG, whose activities are supervised by IGDN, is responsible for the review or study of safety aspects of each nuclear weapon system and the procedures for its employment. The criteria against which the NWSSG evaluates a nuclear weapon system are the safety standards prescribed in DOD Directive 5030.15. These standards are designed to provide maximum safety consistent with operational requirements. As a minimum, the standards to be applied are as follows:

• There will be positive measures to prevent weapons involved in accidents or incidents or jettisoned weapons from producing a nuclear yield.

• There will be positive measures to prevent *deliberate* arming, launching, firing, or releasing except upon execution of emergency war orders or when directed by competent authority.

• There will be positive measures to prevent *inadvertent* arming, launching, firing or releasing.

• There will be positive measures to insure adequate security.

The membership of the NWSSG is as follows (Figure 2):

• One member from the Directorate of Nuclear Safety (the chairman).

• One member from the Directorate of Aerospace Safety when a weapon system involving a missile is to be studied.

• One member from each of the following major commands: AFSC, AFLC, ADC, ATC, SAC and TAC.

• One member from each of the following overseas major commands: AAC, PACAF and USAFE, when a nuclear weapon system for which it has a responsibility is scheduled for study.

• One member from the Defense Atomic Support Agency (DASA).

• One member from the Atomic Energy Commission.

An important product of the weapon system safety studies is to formulate proposed safety rules for the system under study. During the normal development of a nuclear weapon system, an Initial and a Preoperational Safety Study is conducted by the NWSSG. The purpose of the Initial Safety Study is to identify deficiencies of the weapon system with respect to safety and/or to provide guidance for further development required to enable the weapon system to meet the DOD safety standards. This study begins after the preliminary design reviews (PDR) and before the critical design reviews (CDR) of those subsystems directly affecting nuclear safety. It is not expected that complete design information be available for the Initial Safety Study. Preliminary design information and a preliminary operational concept provide sufficient information for evaluation by the NWSSG to permit that group to provide nuclear safety guidance early in the system life cycle.

At least 150 days before weapon

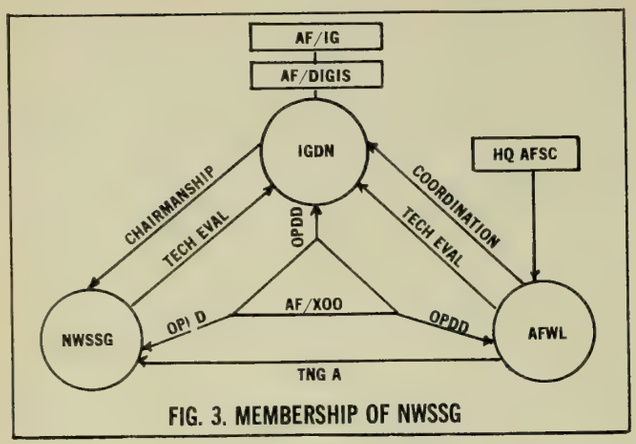


FIG. 3. MEMBERSHIP OF NWSSG

system safety rules are required, a Preoperational Safety Study is conducted by the NWSSG. Its purpose is to determine the adequacy of safety features in nuclear weapon system design and procedures and to provide a basis for developing safety rules. Such rules do not in themselves authorize the particular actions described therein but they do regulate the operation of the nuclear weapon system to insure conformance with the prescribed safety standards. The HQ USAF approved operational plan data document (OPDD) is the using command's plan of system operation and is used to develop the technical nuclear safety analysis of the system under study. The study includes all available technical and procedural information affecting nuclear safety throughout the stockpile-to-target sequence.

Once approved by the NWSSG, the proposed safety rules are submitted through the Deputy Inspector General for Inspection and Safety and:

- Approved by other Air Staff agencies.
- Coordinated with the Directorate Defense Atomic Support Agency (DASA).
- Approved by the Joint Chiefs of Staff (JCS).
- Approved by the Secretary of Defense on an interim basis.
- Coordinated with the Atomic Energy Commission (AEC).
- Approved by the Secretary of Defense on a final basis. (In certain cases, by the President of the United States.)

After the system becomes operational, there may be a requirement to change operational procedures and/or to modify the weapon system. If it is anticipated that a rules change may be required or if nuclear safety is significantly affected, a special study or an addendum to an existing study may be conducted by the NWSSG.

AFR 122-1 requires the Commander, AFSC, to provide the USAF focal point for technical aspects of nuclear weapon system safety. The Air Force Weapons Laboratory (AFWL) is the principal AFSC organization charged with planning and executing the USAF exploratory and advanced development programs in nuclear weapons components, advanced weapons technology, radiation hazards, nuclear warfare analyses, civil engineering and nuclear safety. Closely tied to the operations of the Directorate of Nuclear Safety and the NWSSG is the Nuclear Safety Division of AFWL. In addition to acting as the technical focal point for nuclear weapon system safety, the AFWL:

- Develops nuclear safety design and evaluation criteria.
- Reviews contract data requirements list (CDRL) which relate to nuclear safety before the System Program Office (SPO) contracts for a nuclear weapon system.
- Provides a member of the Safety Safety Group (AFR 127-1) for nuclear weapon systems.
- Provides nuclear safety certification to AFSC for equipment and procedures used with nuclear weapons.
- Evaluates all proposed nuclear weapon system changes or modifications referred to AFWL by AFSC or AFLC which may have an impact on nuclear safety.
- Evaluates nuclear weapon system problems, determines design implications and takes appropriate action.
- Insures that publications for which AFSC is the management agency, are in consonance with applicable nuclear safety rules, standards and procedures.
- Prepares a technical nuclear safety analysis (TNSA) for Initial Safety studies.
- Prepares a TNSA for Preoperational, Special and Addendum safety studies consistent with the Air Force-approved OPDD.

For fulfilling these responsibilities in an outstanding manner, AFWL was awarded a USAF nuclear safety plaque in 1969.

The above discussion defines the functions of IGDN, the NWSSG and the AFWL with respect to nuclear weapon system safety (Figure 3).

It is these three organizational entities which are vitally involved, along with many other organizations and individuals, with planning for and maintaining nuclear safety throughout the Air Force. This article is written to encourage confidence, cooperation and dedication across the nuclear safety spectrum. *ED. NOTE: The Nuclear Safety Program of each service was established by the DOD at the direction of the President. Nuclear Weapon System safety rules and rules changes require the approval of the Secretary of Defense, and in some instances the approval of the President of the United States.* ★

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UNITED STATES AIR FORCE

WELL DONE AWARD

Presented for outstanding airmanship and professional performance during a hazardous situation and for a significant contribution to the United States Air Force Accident Prevention Program.



Captain
Wyman M. Rish

319th Bombardment Wing
Grand Forks AFB, North Dakota

On 21 January 1970 while flying ten missile crew-
ıembers to sites in the Grand Forks complex, Captain
ish experienced a catastrophic failure of major com-
onents of his UH-1F helicopter. A latch failed, allow-
ıg a large section of cowling on the forward section
f the helicopter to separate from the aircraft. The
owling struck and damaged the main rotor blade, caus-
g severe vibration, then blew into the air boom and
il rotor. The tail rotor and allied gear box were torn
om the aircraft, causing loss of directional control
ıd a severe balance problem. Captain Rish correctly
ıalyzed the failure and initiated proper emergency
rocedures. He immediately told his passengers to
sume crash position, called Grand Forks Tower ad-
sing them of his pending emergency landing, and
lected an open field directly ahead of his aircraft.
lthough he had no directional control and could not
ply engine power, he accomplished a perfect auto-
tational descent and landing.

Within 15 seconds of the original cowling latch
lure, Captain Rish had landed his helicopter and shut
wn the engine. Damage to the helicopter was limited
that which occurred while airborne. Captain Rish's
tions undoubtedly saved the lives of all ten of his
ssengers and prevented loss of his aircraft. WELL
ONE! ★


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Aerospace SAFETY



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DECEMBER 1970 AFRP 127-2 VOLUME 26 NUMBER 12

BEYOND THE GATE

There are certain hazards attached to military flying. The Air Force recognizes them and has identified, trained, motivated, inspected, surveyed and planned to eliminate, or at least, accommodate them. And we have been quite successful. But there is another area in which hazards abound and it lies right outside the base gates. It is our public streets and highways.

During this holiday season many aircrewmen will enter this arena where nearly 60,000 people lost their lives last year. Your exposure will range from to-and-fro trips between the base and home, store, etc., to visits to the folks for the holidays. You will be putting your judgment, driving skill and degree of maturity on the line against other drivers with trigger tempers—poor driving skill—substandard cars—fatigue—booze—careless driving habits—an urge to beat the other guy.

With the inclement weather normal for this time of year, you will face

wet pavement—snow—ice—fog—rain—possibly blizzard conditions.

Drive with the care and judgment with which you fly. The Air Force needs you back on the job when the holidays are over—fit, refreshed and ready to resume your profession, not DOA. ★



OF CHRISTMAS, OF AIRPLANES, AND OF THE SEA

Grover C. Tate, Jr, General Dynamics
Fort Worth, Texas





Humbug!

Like always, I waited until the last minute to start getting the Christmas cards ready for mailing. When it was necessary to really face the issue, I got all of the paraphernalia together, chased the kids out of the den, chastised my wife for delegating this chore to me, growled another "Humbug" and started to get with it.

First order of business was to go through the address book, old correspondence, and the phone book to get current addresses. This operation was like sorting out magazines, you find so many interesting things to read that you lose sight of the job at hand. There would be a name that would start the memory to function, a name that would dredge up memories of the big war, of schools, of bars in faraway places, of excitement, and of friendship. Then there would be a name that would bring sadness, a friend no

OF CHRISTMAS OF AIRPLANES AND OF THE SEA

CONTINUED...



longer among us, a name to which no Christmas card would be sent. As I read through the names, it was startling to see how many of the old friends were gone. I could never find the strength to draw a line through these names, for a cold black mark did not seem a proper way to dismiss a friend.

Captain D. C. Bass was the first of these names. Several years ago he had tried to penetrate a thunderstorm rather than go around it. He was flying a multi-crew airplane and when it was smashed to bits, a number of names were eliminated from my Christmas card list.

After that was an old buddy named Blake. He was a natural flyer and seemed to make no mistakes, until he buzzed a beach in Florida and hit the water with the props. He and Langfeld, the copilot, managed to get about 600 feet before the aircraft dived into the sea.

Then there was my old philosopher friend whom we all called The Deacon. His only mistake was to leave his oxygen mask in his equipment bag while flying in the pressurized compartment of a big bomber. A sudden flash fire caused decompression, gobbled up what oxygen was available, and by the time other crewmembers could get to him, The Deacon was gone.

Reuben Diehl was the next name that should have been crossed from the list. Reuben had taken a flight check with an old buddy as flight examiner. With anyone else along, Reuben would have failed miserably, but old buddy-boy had given him the gentle treatment, warned him to sharpen up a bit, and then signed him off as qualified. Reuben failed to recognize his shortcomings, didn't make any effort to sharpen up, and when he lost an engine after takeoff, just didn't do the right things.

Now came Erbach, the engineer, the precise, the reader of the fine print in the tech orders, the one who didn't make mistakes. It was ironic that he should be the victim of the mistakes of others. A mechanic had failed to safety wire a prop governor control and the prop ran away during flight. Erbach got it feathered but it went on by the stops and into reverse. He managed to hold the shaking beast until the rest of the crew got out, but he rode it into the ground.

Graham was another victim of someone else failing to do a good job. He was lined up for takeoff on a 110° day when his airplane exploded. A simple fuel tank vent line had been kinked during installation and when the pressure exceeded the tank limits, the bird just came apart in one big boom.

Now came Honaker. With a six engine aircraft he started his takeoff with two in reverse, didn't make check speed, still tried to go, and wound up in a lake at the end of the runway.

Then Hartman, who let an approach controller who was talking to one airplane and watching another, talk him right into a mountain peak.

And Judson, a navigator buddy, who didn't have the right chart handy and let the pilot descend into the side of a mountain.

So on down the list. Some of the names had been lost in combat, but more in operational accidents than anything else.

Monty—didn't understand the fuel system.

Sgt. Neely—washing the struts of an airplane with hi-octane fuel.

Greene—off altitude resulting in midair collision.

Fitzhugh—accepting a fix for an engine malfunction that hadn't been thoroughly investigated.

Harris—one flight too many after several drinks too many.

Lake—slow rolls in an airplane in which the maneuver was prohibited.

Smitty—trying to abort a takeoff about 20 knots above refusal.

"My God," I thought, "doesn't the airplane forgive any mistakes?"

Yes, it forgives many. Look at some of the living, look at the goofs we've pulled and still managed to survive. Look at yourself.

How does the warning go? "Aviation in itself is not inherently dangerous but like the sea, it is terribly unforgiving of any carelessness, incapacity or neglect."

By now the night had grown late the mood was changed and I had not addressed a single card. Too many thoughts of Christmas cards past, clouded with other thoughts of flying, and of the sea. ★

THE I.P.I.S. APPROACH

By the USAF Instrument Pilot Instructor School, (ATC) Randolph AFB, Texas

Q Consider the following situation. You have been radar vectored to the final approach course and cleared to execute a low altitude approach which depicts a procedure turn. Are you required to fly the procedure turn?

A Whenever you are given radar vectors to a final approach position, the ATC controller is not required to provide separation throughout the procedure turn airspace. If you desire to fly the procedure turn, then you *must* specifically request it. Additionally, there are two other situations in which a procedure turn should not be flown. They are:

1. When issued an ATC clearance for a "straight-in" approach; or
2. When the initial approach is via a NoPT (No Procedure Turn Authorized) course.

In any of these situations, proceed over the FAF at the prescribed altitude and continue inbound on the final approach course without making a procedure turn, holding pattern, or other aligning maneuver.

HOLDING

Q At right are three typical TACAN holding patterns. Considering the position of the aircraft, what do you do when ATC clears you for an approach?

A In Figures 1 and 2 you have the option to continue in the holding pattern to the IAF or turn and proceed direct to the IAF. In Figure 3 you have the option to continue in the holding pattern to the *holding fix*, or turn direct to the *holding fix*, then direct to the IAF. You may go direct from the holding fix to the IAF unless there is a specific route designated on the approach chart. If there is any question in your mind, ask the controller if you are cleared direct to the IAF.

NOTE

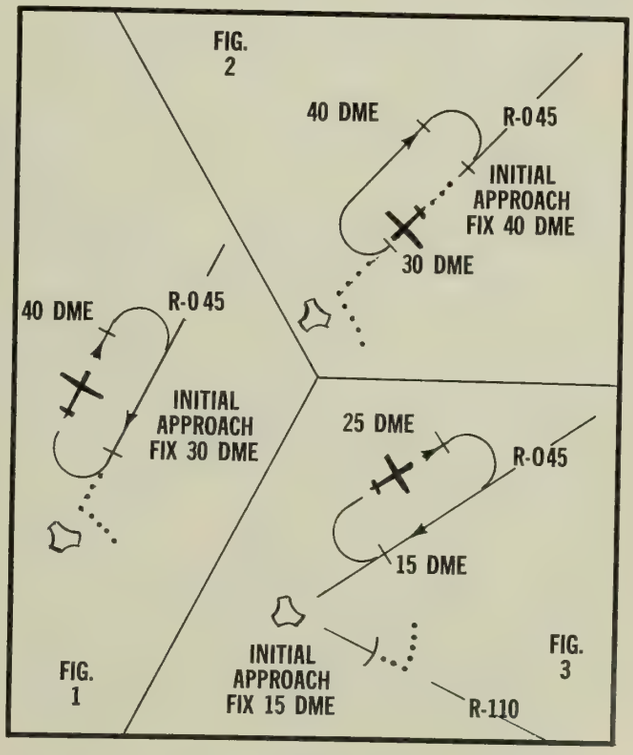
July 1970 Approach article stated that the tower cannot deny a VFR takeoff request even though an IFR flight plan was filed. A word of caution is in order. In requesting a VFR takeoff, you must remember that future IFR clearance may be denied or delayed.

USAF IPIS GREETINGS

December 1970 marks the sixth year of continuous monthly IPIS Approach articles. As you are aware, questions from the field have been a significant portion of these articles. The IPIS is your representative and point of contact for instrument flying needs. Continuous revision to manuals, regulations and documents (e.g., AFM 60-16, AFR 51-37, AFM 55-9 [TERPs], and FLIP) will prompt many new questions and problems which will require interpretation and answers. We are receptive to your questions and suggestions and they are used to help us develop instrument flying procedures and techniques. Address questions and suggestions to USAF IPIS (FT-FTYI) Approach, Randolph AFB, Texas 87148, telephone extension 4207, 4884 and 3092.

The USAF IPIS wishes you and your family a very Merry Christmas and a safe and prosperous 1971.

H. D. ALLSHOUSE, Lt Colonel, USAF
Commander, USAF IPIS



BEHIND THE OHR

OPERATIONS THAT CAUSE MOST FREQUENT AIR TRAFFIC PROBLEMS...



CMSgt James R. Kelley, AFCS, Richards-Gebaur AFB, Missouri

"Approach, this is SCAT 41, over X-RAY on the hour, 7000, heading 270, estimating your station at 20, request GCA, advise my IFF is inoperative."

"SCAT 41, Drumfire approach, turn left heading 180, maintain 7000, for radar identification."

"SCAT 41, Drumfire approach, radar contact, 28 miles north, descend and maintain . . . etc."

Don't let the apparent routine conversation above fool you. A period of sheer panic developed only minutes later when SCAT 41 broke out of the undercast lined up with a mountain just 12 miles east and 20 miles north of his destination. Approach kept telling him he was on a long final to runway 18.

You ask, "What happened?" In this case, SCAT 41 had made one small error. He never reached X-RAY and, through some fluke of human frailty, had reported over X-RAY when in fact he was over an intersection 15 miles east of X-RAY. Why didn't the controller catch the error? Because there was a west-bound aircraft near X-RAY which did turn inbound to the base at the time the controller issued the identifying turn.

Fortunately such incidents are very rare. But they do happen, and part of the job of the Deputy Chief of Staff, Flight Facilities, HQ AFCS, is to analyze these incidents and do what is necessary to eliminate or reduce the possibility of occurrence.

As might be expected, the information on SCAT 41 arrived via an Operational Hazard Report (OHR). Each OHR involving air traffic control or navigational aids that is received by an AFCS unit is processed in two ways. First, the local flying safety office is given the results of the investigation and the report is then processed back to the originator. The second method results in the report being processed through AFCS channels. A condensed report of each OHR is forwarded to DCS/Flight Facilities and included in their data analysis program.

This may sound like the beginning of another headquarters-oriented paper exercise, but, in fact, the effort has proven well worthwhile. While a single incident may be of only passing interest, a pattern of repetition or similarity sometimes shows that it's not the individual who is at fault, but the system itself. As a result, the command has been able to effect many changes to air traffic procedures, locally and worldwide, which should help both the pilot and controller

While compiling the statistics, there is a category called "Pilot Error/Education." Data is logged in this category when a pilot fails to comply with a pilot-oriented directive or appears to be unfamiliar with an air traffic control directive. Sometimes the fault rests with the same pilot who submitted the OHR. More often it's the fault of the pilot of another aircraft who set the scene for the incident. A relatively small percentage of the OHRs are caused by pilots, but it's surprising how often the same operations continue to crop up in the reports. Here's a rundown on the operational areas which cause the most problems.

Paragraph 2-3c, AFM 60-16, defines the procedures that are applied to aircraft in a "minimum fuel" condition. Traffic priority is not given to aircraft that have declared minimum fuel. Too often the pilot feels that normal sequencing with other traffic does not satisfactorily recognize the urgency of the situation. Pilots should be aware that the provision of priority is not applicable to minimum fuel operations.

Paragraph 4-6, AFM 60-16, requires compliance with all instructions issued by an air traffic control agency unless an emergency or safety consideration makes compliance impractical. If compliance is impractical, the pilot has available several courses of action. He should not accept a clearance that requires a compromise to safety. Conversely, if the clearance does not require a compromise to safety and an emergency does not exist, the pilot is expected to follow the clearance. In any event, if the clearance is not followed for any reason, the ATC agency should be notified and/or an amended clearance requested.

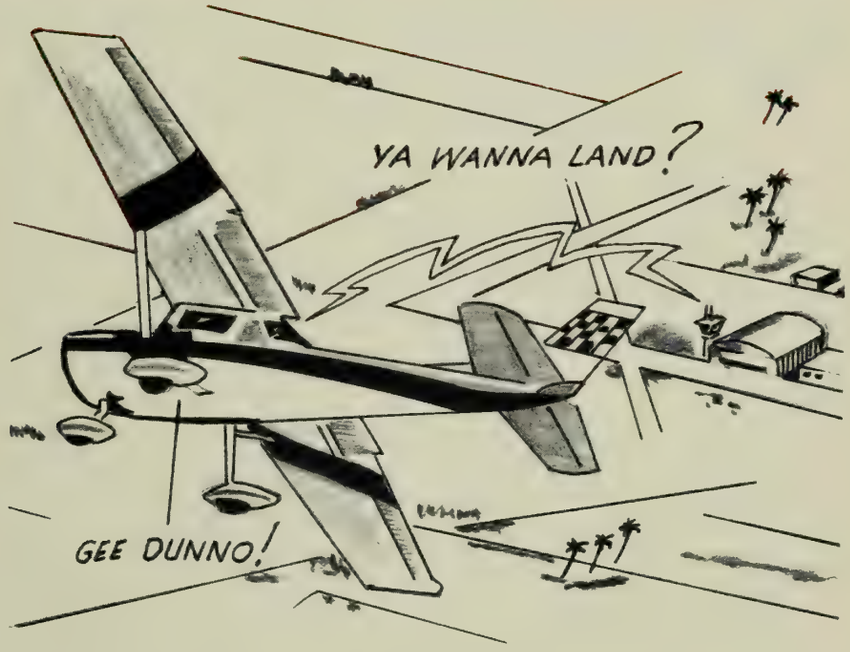
Paragraph 5-5, AFM 60-16, is closely related to the paragraph above. *All* operations in an airport traffic area require ATC authorization. The majority of the discrepancies involved in this category concerned non-USAF aircraft proceeding into the airport traffic area without authorization and causing conflictions with the USAF traffic. Paragraph 7-2, AFM 60-16, concerning the "see and avoid" responsibility of the pilot is the primary means of averting a catastrophe in such instances.

Paragraphs 116, 420 and 422, FAA Handbook 7110.8A, are concerned with VFR runway separation criteria. If reduced runway separation procedures are in effect, all locally assigned pilots should be familiar with their use. Also, all

Continued

WHAT'S A LEFT DOWNWIND?

The following exchange took place at a major airport serving all kinds of private, commercial and military traffic. It vividly illustrates why pilots must keep their "head out of the cockpit," especially around airports. *(The identification of the light aircraft has been altered. Ed.)*



1627—Honolulu Tower: Cessna 123 report left downwind, Runway 4.

1628—Honolulu Tower: 123, report left downwind Runway 4. Over.

Cessna 123: Roger, this is Cessna 123. Please repeat and explain.

Honolulu Tower: Cessna 123, what is your request?

Cessna 123: I don't know what

Continued

OHR

VFR arrival separation applied by the controller is totally dependent on the actions or reactions of the pilots involved. If the controller, in his judgment, feels that adequate separation exists, or anticipates that it will exist, he will issue appropriate clearances. The pilot has an opportunity, and the responsibility, to insure that compliance with this clearance does not cause a hazard. A go-around initiated by a pilot, for example, only confirms the fact that the controller cannot guarantee separation during such operations. Pilots should be aware of the joint pilot-controller responsibility for the success of VFR operations, and not consider the provision of separation a controller responsibility.

Paragraph 775, FAA Handbook 7110.8A, concerns the provision of additional services to aircraft under radar control. A review of the OHRs indicates that some pilots are not aware of what an "additional service" is, or the circumstances under which such service can be provided or terminated. Section 15, Chapter 5, FAA Handbook 7110.8A, provides complete definition of the services involved, their application and makes reference to the priorities employed. Every pilot should be familiar with these procedures and the controllers' responsibilities and limitations.

Paragraph 845, FAA Handbook 7110.8A. Several pilots objected to the controller requesting information during an emergency. Their objections were valid; i.e., the nature of the emergency made it impossible to provide the information when requested. The controller, however, is complying with directives when he requests such data. If it is not possible to provide the information, the pilot should so state. The requirement for requesting such information cannot be deleted due to the needs of the various base rescue agencies. The procedures for obtaining this information are defined in paragraph 845, FAA Handbook 7110.8A.

You might want to kick some of these subjects around during your next flight safety meeting or instrument school session. While many of these points are controversial and argumentative, the more discussion the better. If changes are needed, AFCS is prepared to assist. Recommendations for change should be forwarded on an AF Form 847 through the Commander, AFCS, Richards-Gebaur AFB, MO 64030 to HQ USAF (XOOTFA), Washington, DC 20330. ★

DOWNWIND

you mean by what you said.

Honolulu Tower: What do you want? Do you want to come in for a landing?

Cessna 123: Yes.

Honolulu Tower: O.K. I want you to report on the left downwind for Runway 4. Over.

Cessna 123: On a left downwind? I don't know what you mean.

Honolulu Tower: You don't know what a left downwind is?

Cessna 123: No.

Honolulu Tower: O.K., where are you now?

Cessna 123: I am coming over the golf course.

Honolulu Tower: O.K., you want to turn right and fly a southwest heading.

Cessna 123: O.K.

At this time another aircraft intervened: I am over the golf course and I don't see him.

Honolulu Tower: Cessna 123, rock your wings.

Honolulu Tower: Cessna 123, rock your wings. Over.

Cessna 123: Roger.

Honolulu Tower: O.K. I have you in sight. Come toward the tower and fly your present heading. I will tell you when to turn.

Cessna 123: Roger.

Honolulu Tower: Cessna 123, turn right to a southwest heading now. Southwest about 220 degrees. Over.

Cessna 123: Roger.

Honolulu Tower: Cessna 123, do you see the Cessna ahead and to your left on a base leg over the Hickam Golf Course? Over.

Cessna 123: I can't see what you mean—over the Golf Course.

Honolulu Tower: Do you see the Cessna over the Hickam Golf Course about to turn over Runway 4? Over.

Cessna 123: I can't spot him. The sun . . . There he is. Yeah!

Honolulu Tower: O.K. Follow him. Wherever he goes, you go. You can start a base leg anytime.

Cessna 123: Roger.

Honolulu Tower: Cessna 123, clear to land Runway 4R. Land on the same runway the Cessna did.

Cessna 123: Roger.

Heads up! ★

Contributed by:
Maj Thomas E. Boyle,
6486th Air Base Wing



JUST ONE OF THOSE THINGS... OR WAS IT?

Col Clarence L. Carson, 380 Strategic Aerospace Wing, Plattsburgh AFB, New York

A man in uniform, wearing the Chaplain's Cross over his left breast pocket rings a doorbell in the family housing area of an Air Force base.

A petite brunette hurries from the kitchen, wiping her hands on her apron. She has been preparing dinner and is expecting her husband home any minute, tired and hungry from a long training flight.

The meal she has so carefully prepared will never be eaten. Her world has suddenly fallen apart and there is little anyone can do to change that awful fact.

The Wing Commander comes to call. He knows there is little he can do or say to comfort the wife but he tries. ". . . It was just one of those things that happen. He was turning to final approach for landing when something went wrong and there wasn't enough time or altitude for him to recover or bail out. It was just one of those things that can happen. . . ."

Hold it! *Was* it just one of those things? Are accidents that occur because of mechanical failure inevitable? In this case a flap hinge bolt was improperly installed and the flap tore loose from the aircraft. *Somebody* forgot to safety the bolt so it couldn't work loose. *Somebody* signed the "Inspected By" block in the form, certifying that he had inspected the work and found it properly accomplished. *Did* he inspect it? Or was he in a hurry and signed off the form somebody brought him without actually looking at the hinge bolt?

How about the guy who did the job? He was properly trained and he had a tech order to tell him exactly how to replace that hinge bolt. Did he check his tech data to insure that the job was complete before he signed it off?

I am afraid that too many times we have a tendency to shrug off these facts and minimize our lack of responsible conduct with the statement, "It was just one of those things. . . ."

I fail to see, however, how the supervisor and mechanic involved can look at themselves in the shaving mirror each morning without thinking, "If I had done the job right, that wife wouldn't be a widow; those kids would still have a father. . . ."

We have inspection criteria, Quality Control activities, MSET evaluations and a wealth of technical data available to us, all designed to insure that when a crewmember straps himself into a flying machine that it is a good machine, as good and as safe as we can humanly make it. Every technician who touches that aircraft, from the guy who builds it, to the guy at the depot who does the IRAN, to the airman on the flightline, has the *responsibility* to do the job right and, considering what is at stake, he must certainly *want* to do the job right.

I am certain that, if every man in the maintenance complex will keep in mind at all times that the work he does is vital, that lives depend upon his skill and integrity, no man would fail to take this responsibility seriously.

The emphasis on the "Responsibility Factor" must be exercised by *every* level of supervision from the Wing Commander through his Deputy Commander for Maintenance, down to and including the aircraft crew chief. It must be expressed in every positive way possible by all concerned so that *no man* will fail to recognize his responsibility or the importance attached to his particular task.

It is only by this means that we can achieve our objective of quality maintenance. The success of our effort depends upon the acceptance, recognition and discharge of responsibilities by each and every man in the maintenance complex. ★

Capt Dennis Michels
USAF Dispensary
Norton AFB, CA

eye-deas about vision

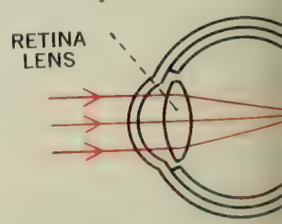


CAPTAIN JOHN DOE, golfing archrival of Lieutenant Oscar Nini, approached his tee shot on the par four 18th with all the anxiety everpresent in the weekly "Lemonade Open." Two things were against him—twilight had set in and they were playing a strange golf course. After extensive deliberation, Captain Doe played his second shot with a four iron. He struck it squarely and waited intently only to be shocked by the uniquely aggravating sound of his ball splashing in the small pond just in front of the green. Needless to say, Lieutenant Nini won the "Lemonade Open" that week. *More important, however, is the possibility that the same circumstances of strange terrain and twilight could have resulted in a short landing instead of just a short four iron shot.* Let us explore some possible explanations for Captain Doe's error in judgment.

Eyes fall into three general categories according to the position of the image formed by the eye's optical system relative to the eye's sensitive layer, the retina. *Emmetropia* (normal vision) exists when the image is formed directly on the retina, *hyperopia* (farsightedness) when the image is behind the retina and *myopia* (nearsightedness) when it is in front. (Fig. 1)

The emmetropic and moderately hyperopic eye, barring abnormal physical characteristics, can distinguish an acuity level of at least 20/20. On the other hand, the uncorrected myopic eye suffers from subnormal visual acuity commensurate with the amount of myopia present.

Before going further, you should know that the eye is not a stati



EMMETROPIA

organ and undergoes significant functional changes in different illumination levels and for different visual stimuli.

During daytime (photopic) vision, the eye is said to be in a state of light adaptation. The acquisition of this state is a rapid process. In fact, from a state of total dark adaptation, the change is usually complete in about one minute. Photopic adaptation is characterized by an eye maximally sensitive to yellow-green light, with maximum visual acuity, depth perception, stereopsis (binocular depth perception), and depth of field and focus (flexibility). In addition, the light adapted eye is more far sighted (or less nearsighted) than at any other state of light adaptation.

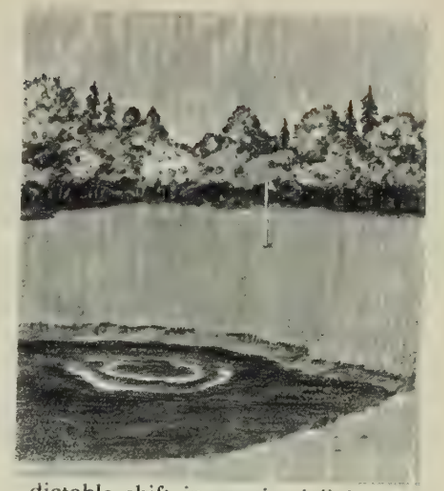
Dark adaptation occurs in the transition from daytime (photopic) to twilight (mesopic) to night (scotopic) vision. This process is much slower than light adaptation even if darkness is encountered suddenly. Total dark adaptation requires approximately one hour. Under night conditions the eye is most sensitive to blue-green light, is more nearsighted (or less farsighted), and exhibits less depth of field and focus than the daylight conditioned eye. Too, some eyes suffer from diminished acuity, depth perception, and stereopsis in scotopic illumination.

A normal or slightly farsighted eye in daylight will often become nearsighted at night. The degree of change is individually variant, but often sufficient to reduce 20/20 daytime vision to 20/30 or 20/40 at night. Obviously, there will be a corresponding decrease in depth perception. Fortunately, with application of appropriate corrective lenses for this night myopia, visual acuity and depth perception can be brought back to normal.

During routine eye examinations I almost daily encounter a pilot with a night myopia problem. Most of these patients seek my services because they have become aware of decreased vision when driving at night. They are able to detect this problem more readily when driving than flying because road signs serve as an indicator. Unfortunately, many cases of night myopia go undetected since routine screening procedures presently employed provide only acuity material with contrast equivalent to daytime vision.

An incidental point of interest concerns the similarity between night myopia and empty field vision (encountered when staring into space). In both cases the eyes are focused at a point closer than 20 feet. For years pilots have been told that an occasional focus on the ground or other distant object will allow the eyes to remain focused at a distance when they return their visual direction to the empty space ahead. The advantage would be quicker detection of distant aircraft. But accommodation (focusing) cannot be voluntarily regulated and is therefore almost entirely reflex in nature. When the gaze direction is returned from a point of reference to empty space, the focus point in space almost instantaneously returns to a point within 20 feet. The primary difference between night myopia and empty space myopia is that night myopia can be corrected and empty space myopia cannot.

As mentioned earlier, scotopic (dark) adaptation manifests a predictable shift in maximal light sensitivity from yellow-green to blue-green (short wavelengths). Why, then, does the Air Force use red (very long wavelength) rotating beacons as anticollision aircraft lighting? The practical implications are debatable, but theoretically a beacon of shorter wavelength should be employed.

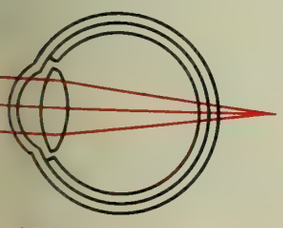


The nature of the preadapting illumination level severely affects eye sensitivity during night vision. After several hours of exposure to sunlight, a whole night of dark adaptation is not sufficient to bring sensitivity back to its previous level. However, the daytime use of dark sunglasses obliterates the adverse effect of high light intensity on night visual sensitivity.

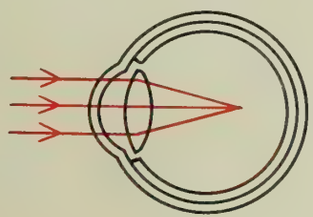
From what has been said we can formulate the following recommendations:

- Routine yearly eye examination for all pilots to replace present screening techniques.
- Application of sunglasses during all daytime flying and during preflight exposure to high illumination levels.
- Review of the present anticollision aircraft lighting systems.
- Awareness by pilots that while the eyes may be 20/20 during the day, night vision can often be much less.

Capt Michels is an optometrist who became interested in the special vision problems of pilots. Opinions expressed in this article are his own and do not necessarily reflect Air Force policy. ★



HYPEROPIA



MYOPIA

I Hit a Bird

We never really take aim at a bird, but in this case, the bird was probably a bit more surprised than usual when he got zapped.

"Of course I've got wing damage, stupid, I hit a tree." How about that for a reply when you tell your leader he's got a crinkled wingtip? The average jock is usually puffin' and

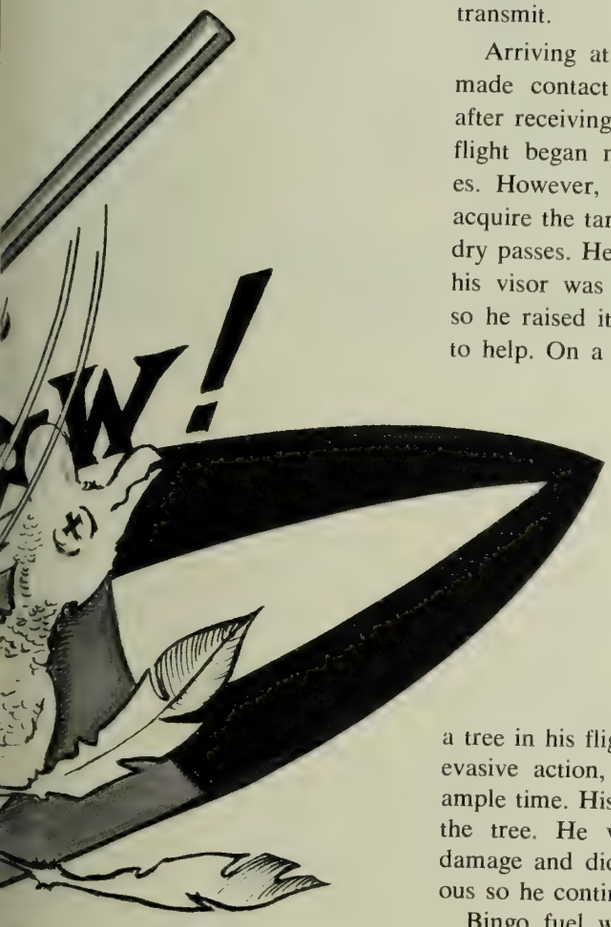


IN a

sweatin' after an incident that results in bent aluminum while in flight. In this case, though, the jock didn't seem the least bit upset by his brush with death; in fact, he seemed and felt quite casual.

The mission began routinely that morning—at least at first. A standard air/ground combat sortie. Preflight and engine start didn't hint of a malfunction anywhere. Shortly after start the pilot noticed heavy fumes in the cockpit. Heavy enough to cause his eyes to smart and water. Oxygen to 100 per cent solved this problem since the gages indicated green across the board, and also since fumes in this particular bird are not unusual. Five minutes after takeoff the pilot selected "normal" oxygen. The fumes were still strong but not enough to warrant an abort, he thought, so he pressed on to the target. He stated that the severity of the fume irritation seemed to diminish and the flight of two continued to the target area at about 16,000'. About this time another minor malfunction cropped up—Lead's mike button had to be depressed toward the side to transmit.

Arriving at the target, the flight made contact with the FAC and after receiving their instructions the flight began making strafing passes. However, Lead was unable to acquire the target and made several dry passes. He finally reasoned that his visor was obscuring his vision so he raised it but this didn't seem to help. On a later pass he noticed a tree in his flight path but took no evasive action, although there was ample time. His left wingtip clipped the tree. He visually noticed the damage and didn't consider it serious so he continued making passes.



Bingo fuel was reached and his wingman joined up for a routine battle damage check. Two notified Lead that he had probably taken a hit and asked if Lead wanted to divert to a closer base. This is when Lead recalled thinking, "Of course I've got battle damage, stupid, I hit a tree." Lead decided to return to his base instead of diverting.

About this time something clicked in Lead's mind—he realized that his actions were not rational so he again selected 100 per cent oxygen. Lead estimated that in about five minutes he became starkly aware of his near fatal accident. Throughout the flight there had been little contact with his wingman due to Lead's inability to manipulate the mike button. However, now that things had cleared up he could easily communicate with everyone.

Approaching home plate, Lead contacted the command post and reported he had "Hit a bird in a tree." Deciding on a straight-in approach, Lead made an uneventful landing.

The SOF was on hand to meet the aircraft and he immediately took the pilot to the flight surgeon.

A physical examination revealed that he was moderately anxious with responses somewhat slower than normal for this individual. Blood samples were taken but were somewhat invalid due to 30 minutes on 100 per cent oxygen.

By now you have probably guessed what happened to this pilot —the Docs feel that a combination of exposure to carbon monoxide combined with high "G" forces on the first few passes were sufficient to cause hypoxia of a degree that would produce these symptoms.

It's too bad that, after all these years, pilots flying a particular model aircraft have come to feel that fumes in the cockpit are "routine." Now we begin to wonder if some losses that were previously considered battle casualties might not have been caused by the same combination of events.

We offer this true story in hope that *you* as the pilot won't treat fumes in the cockpit lightly in the future and that *you,* the maintenance troops, won't be satisfied to simply tighten a few lines in hopes of clearing a "fumes in the cockpit" write-up. ★

what are you worth?



MANY OF THE PROBLEMS besetting young adults and about-to-be adults revolve around what they describe as a search for identity. Psychologists and psychiatrists tell us that a person's happiness, adjustment to society and performance depend to a great extent upon the worth a person places on himself. If he feels that he is doing a worthwhile job and doing it well, then presumably he will perform well. And in the Air Force performance is of the essence.

How about this need for personal identity and worth? Undoubtedly we all have moments of doubt about ourselves, so let's examine the opportunities the Air Force presents for a person to really be *somebody*. For that is what this all boils down to.

The Air Force encompasses just about all walks of life. And each person has a job that contributes toward the success of the Air Force mission. While this article will deal primarily with aircrews and people working in support of flight operations, no slight is intended to the many who perform the hundreds of other necessary tasks to keep this huge machine purring smoothly.

As the saying goes the pilot's job is to "fly and fight." He is the epicenter of the USAF mission and without him the Air Force would cease to be. Conversely, he cannot function alone, and without the myriad of support personnel, his would be a hopeless task. So starting from him let's look at his job and some of the others that make it possible for him to perform effectively.

A pilot is not necessarily a towering giant among men, although he should never take a back seat to anyone. He comes in all sizes and shapes, must be smarter than the average but is not required to be a genius. Once he is trained and qualified he becomes part of a vast, complex team. Take, for example, an interceptor pilot. Like all pilots, his life rides on the skills and dedication of the men who maintain his aircraft. The mechanics must assure that the engine and airframe are in peak condition.

A specialist in electronics, whom he may never have seen, must have serviced and maintained equipment designed and built thousands of miles away by people about whom he knows nothing. To a great extent he works on faith that all of those people did their jobs correctly.

He is vectored to his target by the voice of an unseen controller in whom he must have complete faith; or an automatic system comprised of crystals, diodes, transistors, tubes, and a thousand other things, about which he may know very little, guides him to a spot hundreds of miles distant at the proper time to intersect the flight path of a speeding target. As for himself, he must be an expert at flying this machine under exacting conditions. He must be tuned to the aircraft to detec any abnormality; he must compute fuel requirements and have alter nate plans in case of trouble. He may never see his target, depend ing instead on a synthesis presented on a screen in front of him. If th electronics man made a mistake, i a glitch of some sort sneaks int the system he may miss the targe completely—or collide with it.

Once the intercept is made an the target identified and/or de stroyed, his job becomes one o getting safely back to base. Agai he is dependent upon himself, thos who service his equipment, an voices whose owners he doesn know and will never see. He ma have to land on a wet or icy run way in the middle of a storm. Agai his own flying skills and those un seen voices combine to get hi safely on the ground. The tir squish on the pavement—goo

landing—but it's not over yet. Someone else packed the drag chute that may mean the difference between stopping and going off the end. And there's the barrier—a sort of last chance if brakes fail or are inadequate and the drag chute doesn't do the job. People who know about barriers provide the servicing and a failure on their part could cost him his life.

Other pilots have other jobs in that they fly different types of aircraft on other missions, but they are equally dependent upon people with the same skills. The MAC transport pilot flies an entirely different mission from that of his brothers in interceptors, tactical fighters, bombers and rescue helicopters. Take a C-5 pilot, for example. His is a bird of superlatives: three-quarters of a million pounds, an incomprehensible cost in dollars, engines whose power can hardly be imagined.

Every man on his crew is a VIP: the engineer, navigator, loadmasters, not to mention his alter ego in the right seat. Do you think this man should have any trouble with his identity or worth? Since he is human there will be times.

Perhaps you think your job is menial. Maybe you drive a snow plow. Admittedly that is not the most glamorous job in the world, but to the Air Force—and the crews that will land on your runway—it is vitally important. A fireman's job may be boring for 364 days running. Then on the 365th a bomber crashes on landing and he suddenly must lay his life on the line to save other lives and base facilities. A hero? Perhaps. A man of worth, certainly.

Air traffic controllers have jobs that are nerve-racking, exhausting and, at times, fraught with the potential for a catastrophic mistake. Most are civilians but many wear Air Force blue. Pilots whose assignments take them to many parts of the world find that, while they speak a common language, controllers enunciate with many different accents. Nevertheless, even when they are a bit hard for the untuned ear to understand, they must be depended upon. They are the voices that live in a pilot's earphones and guide him through fair skies and foul, who can steady a pilot, a bit nervous, trying to land with one hundred and a half in turbulence and wind with their calm "you are on glide path, on centerline," "if the field is in sight take over visually, you are cleared to land." Or who gages an approach on an electronic tube, decides a landing attempt would be dangerous and tells the pilot to make a missed approach.

WEATHERMEN get more than their share of joshing but theirs is an exacting job that demands high intelligence and mature judgment. Their work is loaded with frustrations. Winds change direction and speed, temperatures rise and fall, precipitation forms or fails to form—all under exact conditions. The weatherman is trained to know what these conditions are but the tools he works with are limited. Therefore, forecasting the weather is not an exact science. Nevertheless, the men of Air Weather Service do an outstanding job of assisting the pilot.

The Air Force, in essence, is a community of skills. And every person in the Air Force possesses one or more of those skills. There are doctors, nurses and life support technicians ministering to the physical needs of all others. There are some who teach and some who sweep. If you don't think sweeping is important take a look at a jet engine that has ingested a foreign object to the tune of $30,000 worth of damage. Or which failed at a crucial moment and cost an aircraft and a pilot his life.

So far we have talked about people with specific skills. Now how about those who have risen to jobs that are harder to define: commanders and supervisors whose task skills must be complemented by that intangible, almost undefinable quality called leadership? It is common to assume that these people have risen to positions that leave them little doubt of their worth and identity. This may be a wrong assumption, for the leader must make decisions that affect numbers of people, the accomplishment of the mission, and that often are infinitely more complex than those that are made daily by the people under him. Few great leaders who have written of their experiences fail to mention the emotional demands on them during the time when important decisions had to be made. And most freely express the doubts that beset them during such moments.

The Air Force is comprised of people and things, each dependent upon the other. Just as each piece of equipment in the inventory has its purpose, so has each person. Your job may seem to you more, or less, glamorous than another. But you were trained for it and you are provided the tools with which to do it.

Formal recognition may be infrequent and your accomplishments seemingly may go unnoticed. But this is true in all walks of life. It is up to the individual to determine in his own mind who he is and what he is worth.

Not that a word of praise or a pat on the back won't help. The maintenance man, for example, expects to hear about anything that goes wrong with the aircraft he worked on. But when the bird performs like a million he wouldn't mind the pilot telling him so, even if it's only a couple of words, like "good bird today, Sarge."

Such simple forms of recognition along with the knowledge that your job is important to the Air Force mission should remove any doubts that you are someone who is worth a great deal to your country. ★

Aircraft Structures

Richard J. Pennoni, Directorate of Aerospace Safety

This month's article discusses airframe strength and life for two categories or types of aluminum alloys used in the construction of Air Force aircraft. In order to simplify the subject, the figures presented are approximate rather than precise.

Airframe strength and fatigue life depend on the designer and manufacturer in addition to Air Force procurement and operations people, but it is the pilot who uses up the constructed life of the airframe. For example, the Dash 1 VG data permits the pilot to pull limit load of 7.33G on a fighter airplane. This corresponds to the 40,000 psi yield strength shown in Fig. 1 for low strength aluminum alloys such as 2024 series alclad sheet and 2014 series extrusions

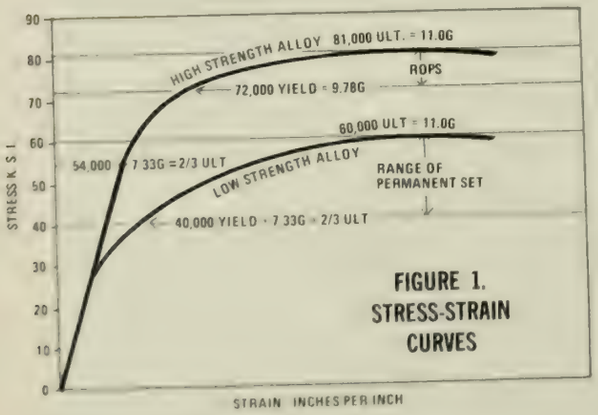


FIGURE 1. STRESS-STRAIN CURVES

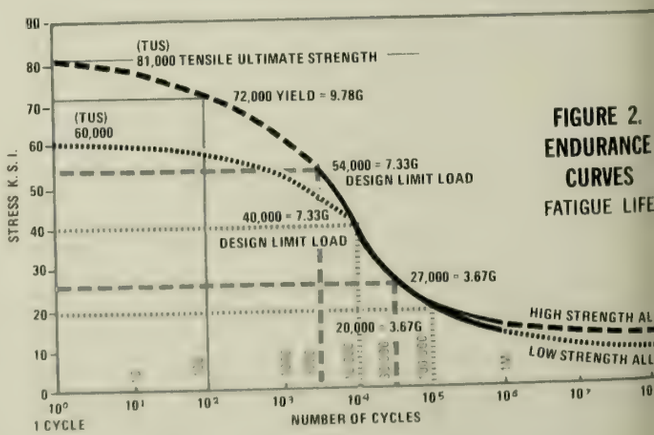


FIGURE 2. ENDURANCE CURVES FATIGUE LIFE

that were used extensively in the 1940-1950 era. Airplanes in that category were the P-38, P-40, P-47, P-51, F-80, T-33A, etc.

Of course, you could "overstress" those airplanes to 1.5 times 7.33G (11.0G) which is comparable to 60,000 psi ultimate allowable of the material, as shown in Fig. 1. In such cases, the primary components (wing, fuselage, etc.) would incur permanent stretch, bend and wrinkle, and perhaps even crack as the 11.0G loading was approached, but catastrophic separation would not occur unless the 11.0G stress level was exceeded.

Now we have higher strength aluminum alloys such as the 7075 and 7178 series, for which the yield strength could be almost twice as high. Logically, it would appear that if the yield strength were doubled, we could use material half as thick, and thus save one-half the weight. Unfortunately, we cannot attain this total benefit, even in pure tension, because of the ultimate strength ceiling. For example, a typical high strength aluminum alloy such as 7075-T6 that is used extensively to save structural weight, is indicated by the upper curve in Fig. 1. This curve shows that we can design to 54,000 psi instead of the earlier 40,000 psi allowable, or a 1.35 strength gain ratio; thus, we can achieve a weight saving in the ratio of 1.35 for parts that are critical in tension such as the wing lower skin and stringers and spar caps.

We cannot take advantage of the total 1.80 ratio provided by the 72,000 psi higher yield strength, however, because we must stay within ⅔ of the ultimate strength ceiling to provide for that one pull-up of one and one-half times the 7.33G without catastrophic failure. Nevertheless, use of the high strength alloy is advantageous because it saves weight and increases performance; in addition, the fighter aircraft now must exceed 9.78G before incurring permanent stretch or cracking of material. However, pullup to the 9.78G which is equivalent to the 72,000 psi yield allowable, becomes detrimental by creating a severe reduction in fatigue life.

Fig. 2 shows that perhaps only 100 cycles are attainable at 9.78G versus 3000 cycles at the 7.33G design allowable. Also, the imposition of stresses between the 7.33 and 9.78G pullup could go undetected because they are *below* the range of permanent set (ROPS) as shown in Fig 1 for the high strength alloy. In such cases, the aircraft fatigue life is used up at an accelerated rate without detection, unless the pilot writes up his "overstressing," or if we install and monitor recording G meters as discussed later in this paper.

Last month's article, "Metal Fatigue in Aircraft," carried the low strength alloy endurance curve which showed that the life of a part conceivably could be 10 times greater if the stress level were reduced to one-half. Values tabulated below from the endurance curves of Fig. 2 indicate that the same general relationship could hold for the high strength aluminum alloy; however, its fatigue life in the operating range of 3.67 to 7.33G would be reduced to approximately 30 per cent. In summary, we save structural weight by accepting a reduction in fatigue life in order to increase performance.

Now, let's relate these stresses and cycles to Air Force operations and aircraft mishaps. You probably have heard the terms fracture toughness, rate of crack propagation, and critical crack length which are pertinent to the prevention of wing separations. These physical aspects vary (even for the same material or component) as has been shown through numerous fatigue tests of simple specimens, composite test panels, and full scale components such as an entire wing structure. Because of this variance or scatter in fatigue data, we cyclic test a fighter airplane to 16,000 equivalent flight hours in order to provide a service life of 4000 operating hours in service. (The load spectra used is based on the mission profile and correlated with recorded service data from earlier fighter aircraft. For example, F-86 or F-102 data used for



	LOW STRENGTH ALLOY		HIGH STRENGTH ALLOY	
PULLUP	PSI	NO. OF CYCLES	PSI	NO. OF CYCLES
7.33G	40,000	10,000	54,000	3,000
3.67G	20,000	100,000	27,000	30,000

F-4C and T-38 load spectra.) And the 4000 hours isn't attained safely if the airplanes are flown more severely than provided for in the initial design!

There are several service examples of this problem in fighter aircraft used for combat type training. Two recent cases involved the loss of a wing during air-to-ground gunnery as shown in Figs. 3 and 4. The fatigue life of the wing lower surface structure had been used up more rapidly because these airplanes were subjected to about 10 passes in each one hour training mission. In addition, the established 4G pull-up was exceeded by overshoot to 5 or perhaps 6G, which, *although permissible in magnitude became disastrous in frequency.*

This is better understood by reference again to the endurance curves of Fig. 2 which show the large reduction in number of cycles to failure as the G load increases. It is possible for the fatigue life to be three times shorter at 6G than at 4G, which would be a triple reduction in flight hours to failure.

Air Force actions to prevent such mishaps involve monitoring of the airplane's usage. Procedures were outlined in the Aeronautical Systems Division Technical Report (TR66-57) published January 1968, and subsequently issued as Air Force Regulation 80-13, dated 31 Jul 69. As explained in this AFR, "The Aircraft Structural Integrity Program (ASIP) is a systematic procedure applied to an aircraft system to enhance design, diagnose potential or impending structural failure, provide a basis for corrective action, and predict operational life expectancy of the airframe."

The program provides for installation of flight recorders in approximately 20 per cent of selected operational aircraft. Analysis of the recorded flight data then can be used to update the load spectra and fatigue analysis, and to evolve modifications of the aircraft to insure "structural safety."

But let's get back to you, the pilot. Don't conclude that the airframe can withstand high stresses up to the 7.33G limit allowable in definitely just because 7.33G is th operating limit shown in the Das 1 handbook. Use what you nee but remember the endurance curv and fatigue life! ★

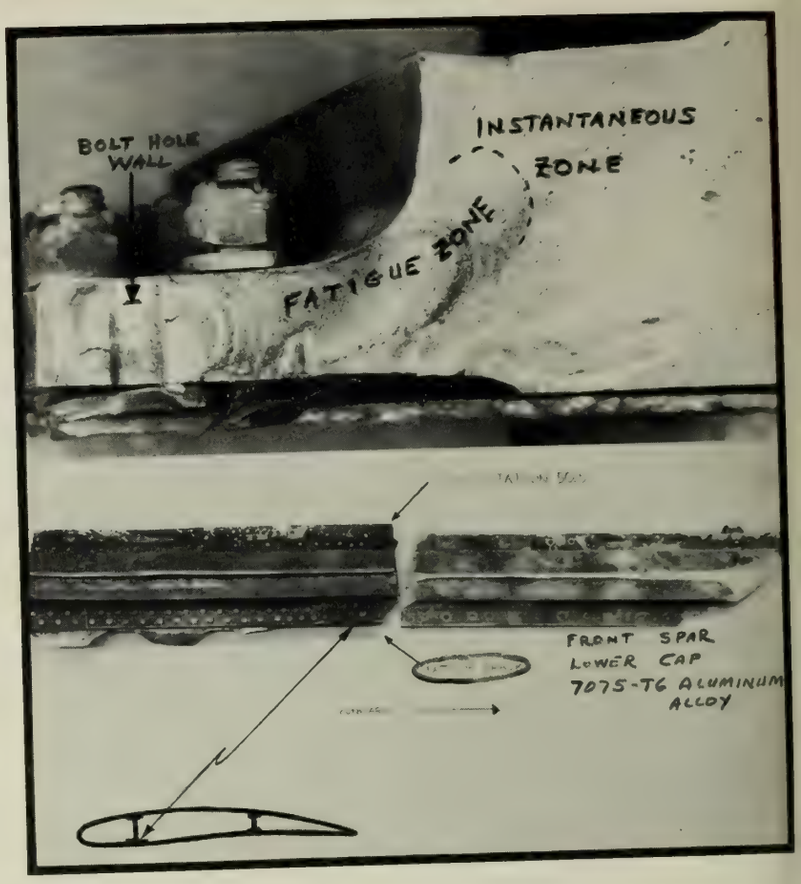


FIGURE 3

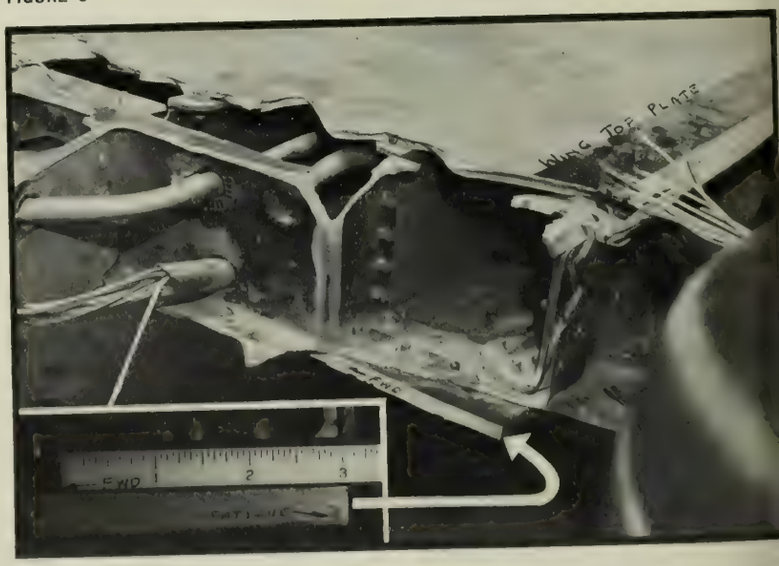


FIGURE 4

IF...



We all remember the story about the rabbit and the tortoise. *If* the rabbit had not stopped for nap he would have won the race. Accident reports don't use the ord *if*. Instead they read, "The rimary cause was (pilot factor)." ontributing causes may go some- ing like this: "1. John Doe did oppy work. 2. John Doe neglected make proper entry in the forms. John's supervisor neglected to properly supervise John." And the contributing causes go on and on. Yet, in the final analysis, the operator is very apt to be charged with the accident or incident. But they could say, *if* John had not done sloppy work, or *if* John's supervisor, etc., this accident would not have happened.

Then after all these *ifs* have been built in, along comes the unsuspecting pilot. He may uncover one *if* that by itself really means nothing, so he presses on. But before it's over the *ifs* have stacked up to a point of no return. So now what? The following case of *ifs* will better illustrate what we are trying to say.

The pilot of an F-105 while preflighting for an FCF noted the throttle binding while going into and coming out of AB. He discussed it with the crew chief, but since it was only a little stiff and the engine functioned okay, he decided to go with it. Takeoff and FCF checks went well until a point where the pilot tried to select AB and he found he could not move the throttle into the AB position. About this time he also noted what seemed to be higher than normal fuel consumption, also that some 1800 pounds of fuel in the forward tank was not feeding. Shortly thereafter the pilot declared an emergency and headed for home base. Approximately five miles from the runway the engine flamed out. The pilot ejected safely and the aircraft crashed just short of the runway.

Let's take a look at some of the *ifs* that contributed to this accident. Investigation revealed that there had been five previous write-ups for a binding or hard-to-move throttle. Also that the most probable cause of excessive fuel consumption was a throttle malfunction which inadvertently selected afterburner fuel flow without afterburner light off. *If* maintenance had reviewed the forms properly, they would have discovered the repeat write-ups on the throttle. Also they would have noted that, in each case, inadequate corrective action had been taken. Of course, *if* fuel had not been trapped in the forward tank for an undetermined reason, the pilot could have made it home okay. No doubt the biggest *if* belongs to the pilot. After all, he was charged with being the primary cause of the accident. But had maintenance eliminated any of their *ifs*, the accident would not have occurred. ★

REX RILEY'S

CROSS COUNTRY NOTES



LITTLE THINGS DO MEAN A LOT...

LITTLE THINGS DO MEAN A LOT. On the plus and minus side of the ledger I have to give a big plus to the transient service that provides crews with a small but invaluable piece of information. A wallet sized card with a list of "likely to be used" phone numbers such as transient maintenance, O club, NCO club, transportation, weather, base ops, etc. Nothing is more exasperating than to have maintenance working on your broke flying machine and you can't find the phone number to call and confirm an ETIC. Having a number of these cards on hand costs very little yet eliminates one more frustration while in transient status.

CHOW TIME. Solving the problem of where to feed late transient arrivals has been a thorny one for years. I've dropped in on several bases that have no facilities handy after 1900. The automatic dispensers, though not the best system look good when there is nothing else available. If you happen t

drop into Columbus AFB sometime you'll see, in base ops, neatly displayed, a rundown of all messing facilities on base complete with where to contact transportation to get you there. As a matter of fact, Columbus made us feel quite at home though unaware of who we were. Sure, this chow is a knotty problem, but put yourself in the position of having flown 15 hours until 0300 and when the turbine at last winds down, you find out that there is no chow anywhere until 0600.

IS THIS YOU? Believe it or not we still have pilots driving airplanes around the sky who don't understand about PCA—Positive Control Area. I actually had a pilot complain to me about the failure of a radar facility to advise him of traffic while on an IFR flight plan in VMC. He was at FL 190 (below the PCA). He just couldn't understand why center didn't have this guy. Sure everybody is supposed to squawk, if they have IFF, but don't count on it. If you're in VFR conditions, below PCA, you better get your head out 'cause your other end may depend on it.

BY A QUIRK OF FATE Rex found himself as a "Space A" traveler the other day. After this experience it may be that we need to take a closer look at what goes on in some of the passenger terminals. This particular one was neat enough until you ventured into the latrine. It was nothing short of a mess. This is one little irritant that our passenger force should not have to put up with. Believe me, realizing that there is no toilet paper at a critical time can be a very irritating experience. It makes me think that we need a checklist before going to the john.

My mail call has been very gratifying the past few months. Both from our traveling Air Force with complaints and kudos about various bases and from base commanders and transient services NCOs wondering what they can do to improve service. For you troops who write Rex personally with complaints, you may rest assured your letters get attention. Many comments are such that they can be resolved by direct contact with the unit involved. However, well documented deficiencies generate a letter to the base commander or a visit by Rex. Make sure you are on firm ground when you criticize. On the other hand, let me know about good treatment as well. Nothing gives me more delight than sending a copy of some jock's letter asking why this base doesn't have Rex's award, to a deserving transient service.

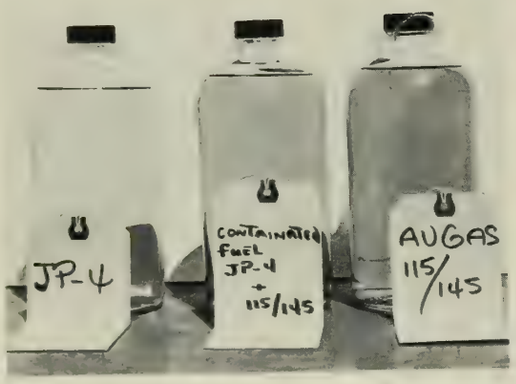
COMPOSITE FLIGHT PLANS were designed to expedite the traveling Air Force in the completion of their business. Ideally, I think that unless some extenuating circumstances rear their heads, a transient pilot should be able to quick-turn in about forty minutes. The most important factors that affect how long it takes to get you airborne again are fuel and clearance. I recently had a pleasant experience along these lines. The 175 indicated that a quick-turn was desired. After landing and clearing the runway, I was informed by ground control that my clearance was available if I was ready to copy. To a pilot in a hurry this is super service. The only thing that made us happier was to see the fuel truck ready to swing into position as soon as we departed the bird. Needless to say, our ground time was something on the order of 18 minutes. All we had to do when we returned to the aircraft was to preflight, crank up and ask for taxi information. What this tells me is that somebody at this base is doing his level best to insure that transients receive good service. Sure it takes a little effort, but this is something I think all bases should strive for. ★



REX RILEY
Transient Services Award

LORING AFB	Limestone, Me.
McCLELLAN AFB	Sacramento, Calif.
MAXWELL AFB	Montgomery, Ala.
HAMILTON AFB	Ignacio, Calif.
SCOTT AFB	Belleville, Ill.
RAMEY AFB	Puerto Rico
McCHORD AFB	Tacoma, Wash.
MYRTLE BEACH AFB	Myrtle Beach, S.C.
EGLIN AFB	Valparaiso, Fla.
FORBES AFB	Topeka, Kans.
MATHER AFB	Sacramento, Calif.
LAJES FIELD	Azores
SHEPPARD AFB	Wichita Falls, Tex.
MARCH AFB	Riverside, Calif.
GRISSOM AFB	Peru, Ind.
PERRIN AFB	Sherman, Tex.
CANNON AFB	Clovis, N.M.
HICKAM AFB	Hawaii
LUKE AFB	Phoenix, Ariz.
RANDOLPH AFB	San Antonio, Tex.
ROBINS AFB	Warner Robins, Ga.
TINKER AFB	Oklahoma City, Okla.
HILL AFB	Ogden, Utah
YOKOTA AB	Japan
SEYMOUR JOHNSON AFB	Goldsboro, N.C.
ENGLAND AFB	Alexandria, La.
MISAWA AB	Japan
KADENA AB	Okinawa
ELMENDORF AFB	Alaska
PETERSON FIELD	Colorado Springs, Colo.
RAMSTEIN AB	Germany
SHAW AFB	Sumter, S.C.
LITTLE ROCK AFB	Jacksonville, Ark.
TORREJON AB	Spain
TYNDALL AFB	Panama City, Fla.
OFFUTT AFB	Omaha, Nebr.
ITAZUKE AB	Japan
ANDREWS AFB	Washington, D.C.
McCONNELL AFB	Wichita, Kans.
NORTON AFB	San Bernardino, Calif.
BARKSDALE AFB	Shreveport, La.
HOMESTEAD AFB	Homestead, Fla.
CHANUTE AFB	Rantoul, Ill.
KIRTLAND AFB	Albuquerque, N.M.

DOES MURPHY PUMP YOUR FUEL?

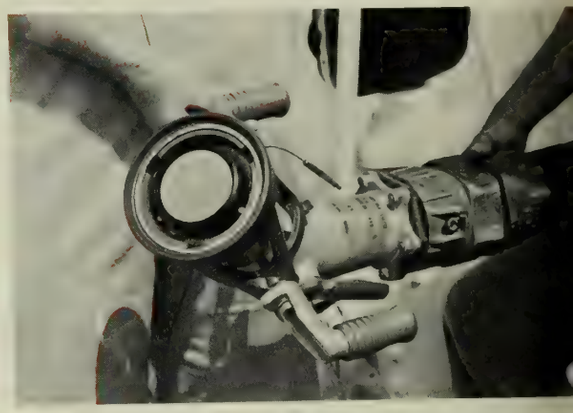


See back cover.



Single point nozzle for JP-4 **will not** connect to avgas.

(Bottom) With the key to the padlock on the avgas fill stand attached to the avgas truck, how can you miss?





IF YOUR SERVICE STATION attendant were to fill your car's gas tank with kerosene, how do you think the car would run? About as well as an aircraft recip engine will run on JP-4.





Key to avgas padlock is attached
o top of avgas tanker.

P-4 must be bottom loaded.

Most of us are familiar with Murphy's Law: "If there is a way o do something wrong, somebody ill do it." With this in mind, the ir Force has taken steps to keep ld Murph from getting his hands certain critical areas. One of these covered by TO 42B-1-1 which as to do with the handling of air-aft fuels—avgas and JP.

To keep Murphy out of the pic-re some Air Force bases have odified their servicing trucks so at it is almost, get that, *almost*, mpossible to service a JP-4 truck ith avgas, or an avgas truck with P-4. For example, the JP-4 truck serviced from the bottom—that a fitting the same as that used on aircraft single point refuelings is attached to the bottom of the JP-4 truck and fuel is pumped into the truck from the *bottom* up.

The avgas truck, however, is serviced through the *top* of the truck. In addition, a measure known as the lock and key method is used to insure that only avgas goes into avgas trucks. The avgas fill stand valve is secured with a padlock and the key is secured to a chain that is attached to the top of the avgas truck.

These are but a few of the precautions taken at various bases to keep Ol' Murph from getting the wrong fuel in the wrong truck. Even with all the precautions, Murphy somehow manages to get into the act. Not long ago a 5000 gallon 115/145 avgas truck was serviced with 3458 gallons of JP-4. The truck was then dispatched to the flightline where the contents were used to service three aircraft: two T-29s and a C-54.

One T-29 aborted on takeoff for lack of power; the C-54 lost power after takeoff, crashed and burned. Fortunately, the crew and passengers escaped without injury. The other T-29 was being serviced while the above events were going on; therefore, the pilot did not get a chance to try his luck at flying a recip on JP-4 fuel.

From 1965 until this latest accident, there have been three major accidents and four incidents attributed to the wrong type fuel. Sixteen lives were lost and two aircraft destroyed. The reasons are varied as to why the aircraft were serviced with the wrong fuel. In one case, the POL dispatcher, receiving a request for fuel for an O-2, thought the requestor was using a short term for F-102 so he sent a JP-4 truck to service the O-2. This resulted in the O-2 making an emergency landing for lack of power.

There are many different ways to prevent an aircraft from being serviced with the wrong fuel. (1) Before servicing the aircraft, the crew chief should ascertain that the truck actually does contain the right kind of fuel. (2) After servicing, ground personnel are required to drain fuel sumps and check for contamination. At this time an alert maintenance man *could* detect a mixture of fuels. However, experiments indicate that this detection would be hard to make except, possibly by smell (if you have a good smeller) or by feel. If it is avgas that has been contaminated with JP-4, the first impression you would get on feel would be okay. (It would feel like avgas.) However, after the avgas evaporates you should be able to detect an oily feel from the JP-4.

Our experiments also indicate that the purple dye in avgas will color JP-4 almost to the point where it would be impossible to detect by sight, unless you had a good clear sample to compare it with. So what we are saying is that once avgas has been contaminated with JP-4, it would take a sharp individual who knows what he is looking for to be able to detect the contamination.

How much JP-4 inadvertently dumped into avgas would it take to make the difference between a catastrophe or just a damaged engine? A large amount would likely keep the recip from running well enough to leave the hard stand. On the other hand, a small amount of JP-4 might allow the engine to run well enough to get the craft airborne and then quit. Jet engines, however, will run well enough on avgas to get you back on the ground.

So what's the answer? How do we keep Murphy from mixing JP-4 with avgas? The answer would seem to lie in well trained, conscientious people and first-class supervision. ★

Tech topics



briefs for maintenance techs

the danger of being a good guy



A minor accident brings to mind an incident that took place several years back in which I was the bad guy. I had been in the organization less than a month. One evening just before shift change I was asked to inspect a C-135 main wheel and tire installation. When I arrived at the aircraft, I found the wheel installed and the jack removed. The crew chief said, "Sarge, all you have to do is sign the forms and she's ready to go."

Well, this crew chief was just a bit unhappy when I insisted on having the job reaccomplished so I could watch the proceedings and check the inner bearing. This was not only a lot of extra work, but it ran way over into the next shift. Needless to say, it didn't take long for the word to pass through the squadron that the old Sarge would not sign off a red cross unless he was sure of what he was signing.

Following is what happened when a *good guy* signed off a red X:

A B-66 pilot was advised by the last chance crew that his right antiskid cover was missing. On the basis of that information the pilot aborted the mission. He was cleared down the active for return to the ramp. The pilot said the aircraft handled as if it had a brake dragging. Because of this he exited the runway at the first turn off and stopped so the fire department personnel could inspect his brakes to see if they were overheating. Everything seemed okay so he proceeded. A short distance later the maintenance people stopped the aircraft to check the missing antiskid cover. They decided it would take too long to replace it as some of the bolts were sheared off, so they waved him on to the parking ramp.

However, this time when he started to taxi, sparks were observed coming from the right wheel. Before he could be stopped the sparks turned to fire which engulfed the wheel well before being extinguished by maintenance personnel and the fire department.

To fill in the missing details, the right wheel had been replaced just prior to the flight crew's arrival and the middle wheel bearing had been left out. This allowed the wheel to shift during taxi, causing friction and overheat. NOTE: No in-progress inspection had been made; the red X for the installation had been signed off after the job was completed. Several people had a hand in this boo-boo; the tire shop for leaving the bearing out and maintenance for not checking to be sure it was installed. But the ultimate responsibility rested on the inspector's shoulders. He signed off the red X indicating he had inspected the installation and found it satisfactory. Yet there was no way he could have known if the bearing was in place unless he had inspected the wheel prior to and during installation.

CMSgt Lloyd Thompson
Directorate of Aerospace Safety



haste makes waste

The crew chief, while performing a "thru-flight" inspection on his F-4, noted that the front cockpit bailout bottle pressure was low. PE personnel were called and they serviced the bottle. About three and a half hours later, just prior to flight crew arrival, the crew chief again noted the same bottle pressure low. So he again called PE. He also reinstalled the front seat pins and the canopy jury strut.

The flight crew arrived shortly and proceeded with the exterior preflight. Then PE arrived and reserviced the bottle, but they did not complete the job until two minutes after scheduled start time. To save time the pilot removed the canopy jury strut and was unpinning the seat when the crew chief took over this task.

Engines were started and the aircraft began to taxi when the maintenance expediter noted sparks coming from the exhaust area. He relayed this to the pilot who shut down on the taxiway. They found the front cockpit canopy jury strut wedged between the left engine intake duct and the fuselage. The pin and streamer were missing. Inspection revealed they had been ingested by the left engine.

Don't cut corners or deviate from the checklist to save time.



missed check

During an FCF, the O-2 pilot shut down the rear engine. When he attempted a restart the prop would not unfeather so he made a single engine landing. A check of the system revealed the prop accumulator preload pressure was low. A leaking filler valve went undetected during preflight, at which time the accumulator had been recharged. A proper check in accordance with the Dash Two would have revealed the leak.

bar fod

Shortly after takeoff on an FCF a T-33 pilot pulled one negative G for three or four seconds to check out the fuel vent warning system. Approximately five minutes later, right aileron was applied to roll level from a left turn but the stick would move only one-half inch to the right of center. The pilot said it felt as though the stick was bumping against a solid object. The pilot elected to make a downwind landing with the wind on the left wing. With the left wing low, right aileron application would not be required. The landing was accomplished without further incident.

An inspection turned up a sheet metal type bucking bar between wing station 137.45 and 148.65 of the right wing. The bar had wedged into the control cables in such a way as to restrict movement of the aileron surface past neutral.



T-38 engine fire

After a landing necessitated by a stuck nozzle in the right engine, a loud noise was heard from the engine. The crew shut down but both fire lights came on. Firemen rapidly extinguished the ensuing fire.

The pilots reported a fuel imbalance that began with the right system 150 pounds low just prior to landing and progressed to 400 pounds after engine shutdown. The major problem was a ruptured hose from the governor to the AB fuel control. There was a smaller leak in the flexible portion of the AB control to AB pilot burner manifold line.

The cause of the rupture was identified as insufficient clearance between the engine and firewall. The engine had been reinstalled during periodic 30 hours before this incident, but clearance between firewall and engine was not in accordance with the Dash 6.

Tech topics
CONTINUED

shade tree mechanic



A jet engine might be likened to a baby, either one will try to eat anything given it.

Take the case of the J-57 engine being run in the test cell for the purpose of carbo-blast, in accordance with the TO. Within 48 seconds after engine start, idle RPM had been reached. For warm-up purposes, the engine was allowed to idle for five minutes. The speed was then accelerated to 85 per cent for another five minutes, then advanced to 95 per cent and apricot pits were introduced.

The test cell operator said that approximately five minutes later the RPM was retarded to 85 per cent and at this time it was noted the grass around the blast fence and near the test cell was on fire. He also said that engine operation was normal, but he couldn't remember what the engine temp was. He then shut the engine down abruptly in emergency.

Investigation revealed extensive damage to the engine to the tune of more than $9000. What was the cause factor? A locally fabricated pit dispenser being used for the carbo-blast had no regulator controls. Therefore, the amount of pits introduced within a given time could not be determined and, since the engine will try to take any and everything it is given, it over-ingested. Locally fabricated equipment should follow mil standards if they are available. In this case, they were.

CB is not a cleaning agent



Bromo-Chloromethane Tech (CB) is a fire fighting agent and is highly toxic. Almost as toxic under certain conditions as Carbon Tetrachloride.

It is not a cleaning agent!

An incident involving the unauthorized use of CB as a degreasing agent points up the potential hazards involved. An automotive hobby shop facility was being cleaned and renovated on a self-help basis. One problem encountered was the grime and oil-soaked floor which had resisted several cleaning attempts. Fire Department personnel were asked for suggestions on how to clean the floor. CB was recommended.

Later one of the volunteer workers was found slumped unconscious in a corner of the hobby shop. An open five gallon can of CB was found nearby. He was alone at the time and apparently had been cleaning the floor using the CB and a small hand brush. By simulating the conditions existing prior to his death, it was determined that he was exposed to an average of 6000 ppm of CB vapor over a 2-3 hour period. This is more than 1000 times greater than the threshold limit value.

No specific directives forbidding the use of CB have been publishe as is the case with carbon tet. Th investigators in this case questione many people who should be knov ledgeable of the hazards of CB, b got several different answers. Obv ously, the fire department personn who recommended CB were n aware of the potential danger a did not understand that the absen of CB on the approved cleaning l in TO 42A1-1-3 indicates prohib tion of its use. AFR 161-10 direc that personnel must have writt certification from medical personn before being issued CB.

(Mission Safety-70 Newsletter #

UEIs VS explosives Safety

John H. Kawka
Directorate of Aerospace Safety

During recent unit effectiveness inspections, command inspectors found some serious explosives safety deficiencies. Some units did not have an explosives safety program (AFR 127-100), while others had only partially complied. In addition, they found such common deficiencies as:

- Commander had no personnel assigned to explosives safety or, if assigned, the people were not familiar with their responsibilities.
- An explosives accident prevention program had not been developed.
- A program for conducting explosives safety surveys had not been established.
- Personnel who cannot discipline themselves to follow good safety practices were not being observed for elimination.
- Hot cargo handling points violated quantity-distance criteria with respect to taxiways, operational aircraft, etc.
- Personnel assigned explosives safety duties had not received training in management of an explosives accident prevention program.
- The explosives accident prevention program did not include the basic elements of engineering, promotion, education, training, analysis and evaluation.
- Monthly explosives safety surveys were not being performed by qualified personnel.
- All areas involving explosives were not included in the survey report.
- Approved waivers were not on file covering all violations of mandatory explosives safety distance requirements.
- Adequate programming or other actions had not been taken to correct safety distance violations within the waiver period.

Safe handling of ammunition and explosives is one of the most serious explosives safety problems that confronts an organization or installation commander.

To insure that their activities measure up to current Air Force explosives safety standards, commanders must familiarize themselves with operations which involve explosives and be able to recognize potential hazards and problem areas. Maximum use should be made of the services and technical capabilities of assigned explosives safety officers, and munitions and armament personnel to insure that explosives material is properly handled.

Explosives operations must be under the direct supervision of a qualified supervisor who is competent and understands thoroughly the hazards and risks involved. Formal training is a basic requirement.

The cardinal rule is to expose the minimum number of personnel and materiel to the minimum quantity of explosives for the minimum length of time. To comply with this rule supervisors must:

- Properly plan explosives operations.
- Provide adequate shielding and barricading to protect personnel and equipment when operational hazards require this protection.
- Use prescribed separation distances between explosives operations and personnel, buildings, runways, aircraft areas, and equipment.
- Minimize concentration of explosives to prevent area saturation.
- Limit the number of personnel to that required for efficient accomplishment of the operation.
- Require personnel to work strictly in conformity with complete and properly approved checklists and standing operating procedures.
- Minimize unnecessary rehandling.

Some operating officials are hard to convince that their operations are governed by AFM 127-100 and other pertinent publications. It would be a good thing if everyone would read or re-read AFM 127-100 which establishes the standards for safe explosives operations. Then they would know the correct actions to take in order to eliminate the deficiencies listed earlier.

We have a pretty good explosives safety record now, but it can and should be constantly improved by knowledgeable operating officials being constantly on the alert and regularly reviewing their operations. ★



Toots

is interested in your problems. She spends her time researching questions about Tech Orders and directives. Write her c/o Editor (IGDSEA), Dep IG for Insp & Safety, Norton AFB CA 92409

Toots receives many queries concerning the AFTO 781 series forms and the material contained in TO 00-20-5. The latter was rewritten and the latest revision was published last July. Nevertheless, the questions are still coming in.

In order to end some of the confusion and assist you fellows in the field who must work with these forms and the applicable tech orders, here are several questions with answers provided to make it easy. Answers are based on material contained in TOs 00-20-5, 1 July 70, and 00-20-1, 1 June 70.

QUESTIONS

1. Who normally puts the symbol in the AFTO 781 forms?

2. Who is authorized to downgrade a red X?

3. Is a red X symbol necessary for a safety of flight discrepancy if the discrepancy cannot be duplicated on the ground?

4. What does a red dash symbol indicate?

5. Is the transient pilot authorized to postpone a required routine inspection or minor maintenance for the purpose of expediting his departure, even when personnel and material are available?

6. What action must the transient pilot take in order to postpone minor repair or routine inspection items?

7. How long is an exceptional release good for when signed by the pilot?

8. How long is an exceptional release good for when signed by a maintenance officer?

9. What is the procedure for changing a red diagonal symbol to a red X?

10. What is the procedure for changing a red dash symbol to a red X?

11. Is the supervisor who participates in accomplishing the repair of a red X condition authorized to sign the "inspected by" block and place his initial over the red X?

12. What is the minimum signature authorized for maintenance record purposes?

13. Does an inoperative pitot static system constitute a red X?

14. When will a red diagonal entry be made for a SOAP sample?

15. The aircraft commander or pilot is required to review what forms prior to flight?

ANSWERS

1. Normally the symbol will be entered by the mechanic or flight engineer. (00-20-5, p 2-82)

2. The maintenance officer or chief of maintenance. (00-20-1, p 3-24)

3. Yes. (00-20-5, p 1-9G)

4. Condition unknown. (00-20-5, p 1-17)

5. Yes. (00-20-5, p 1-92)

6. A written request to such effect will be entered on the AFTO Form 781A by the pilot. (00-20-5, p 1-92)

7. When a release is signed by a pilot, it will be effective only for those flights in which the releasing pilot participates as an aircrew member. (00-20-5, p 2-62C)

8. An exceptional release when signed by a maintenance officer is good for that calendar day, unless additional uncleared red symbol discrepancies are encountered. (00-20-5, p 2-62C)

9. Any individual of higher responsibility within the maintenance or repair activity may change the symbol. He should draw a line through the name of the individual who made the entry and enter his signature within parentheses above or beside the original signature. (00-20-1, p 3-24)

10. When a red dash symbol is upgraded to a red X symbol, the original red dash will be closed out by a remark "Symbol changed to a red X" in the corrective action block and the entry will be reopened in the next open discrepancy block. (00-20-1, p 3-26)

11. Yes, provided he has another member sign the "corrected by" block. (00-20-2, p 3-10)

12. First name initial and last name. (00-20-1, p 6-61)

13. Yes. (00-20-5, p 1-9r)

14. A red diagonal entry will be made on applicable forms when a second oil sample is taken to verify metallic contamination thresholds detected during the preceding oil sample analysis. (00-20-5, p 1-23)

15. AFTO Form 781A, 781H, 781J and 781K. (00-20-5, p 2-5) ★

Ops topics



PUDDLE PROBLEM

We've all had those kinds of mishaps that make us wish we'd "stood in bed." Here's one that no doubt affected a very experienced IP in the same way.

The weather was kind of stinky as he lined up his T-39 on final for an 8000-foot runway with only 5200 feet between the barriers. He couldn't get an RCR but figured a landing roll of about 3500 feet.

At one mile he saw the runway and put it down 100 feet past the approach end arresting gear. All was well until he drove into a big, 1500-foot long puddle. The bird started hydroplaning and drifting left. Just before leaving the runway the tires blew, the bird turned left and skidded sideways and the right wingtip scraped the surface.

Now to the crux of this fiasco. This was not an Air Force base and the last RCR had been taken the day before. Twenty minutes after the incident an updated RCR was provided; it averaged 20 for the entire runway. Hopefully, at a USAF base the aircrew would be told about the 1500-foot long puddle of water which was alleged to have been one to two inches deep. In this kind of puddle you hydroplane, get slush drag and aircraft control may become impossible. There is not now, and may never be, a method to measure your stopping ability in one to two inches of water. ★

THE SQUEAKING WHEEL

Most of us are pretty busy and probably a little bit lazy, which may account for our not squawking louder when we get shorted on something that requires us to expend extra effort. Like, for example, ground egress training for aircrews.

This is an old subject but the fact is that egress training is not as good in some units as in others. There may be one or several reasons for this, but the training probably is as good in any unit as the pilots demand it to be.

Aside from the fact that some people clutch more than others, there's not much excuse for events such as the following:

After a bad landing that ended in some rather severe aircraft gyrations, the student pilot attempted to get out and away from the aircraft. He

- Failed to shut down the engines.
- Took time to remove his helmet.
- Had trouble releasing his leg straps.
- Stood up in the seat, but was restrained by the G-suit hose.
- Went over the side but got hung up on the oxygen hose, still connected to the CRU-60 connector.

If this were an isolated case, that would be one thing. But it wasn't. Similar foul-ups continue to occur. It seems kind of ridiculous to spend all that money on equipment to get a jock out of the cockpit in a hurry in the air only to have him strung up by a strap or hose when the birds starts burning on the ground. ★

BROKEN RECORD

A T-37 was on a routine navigation mission through the mountains. After landing at their refueling base, the crew delayed takeoff due to a big thunderstorm moving northeast over the field. The pilot dutifully rechecked the weather and decided to take off (heading northeast) since the storm had passed by. His cruising altitude was FL 220. After becoming airborne the T-37 pilot evidently heard another aircraft on his route call Center about buildups in the area, and Center told them that there were none on his scope. With this info tucked safely away, the T-37 pilot continued on his way. Approximately 25 minutes after takeoff moderate turbulence was encountered, lasting about 45 seconds. At their next base the postflight revealed hail damage to the nose cap, cracked lenses and torn fiberglass inlet ducts.

At the risk of sounding like a broken record, we have to point out again, FAA radar is not required to relay enroute weather to aircraft in flight. Admittedly, they will be of service to you if at all possible, if you request it, but in many instances the controller will find it necessary to select the circular polarization mode which will eliminate echoes from thunderstorms. Many controllers will go out of their way to advise you of buildups in your path but remember, their primary function is traffic separation. ★

FLIP CHANGES

Stop Over Flight Plan: The hours of fuel on board the aircraft for second and subsequent legs of a stop over flight plan are to be shown in the "route of flight" section (Block 16). Fuel on board for the first leg is to be shown in Block 20. See FLIP Planning, Section II.

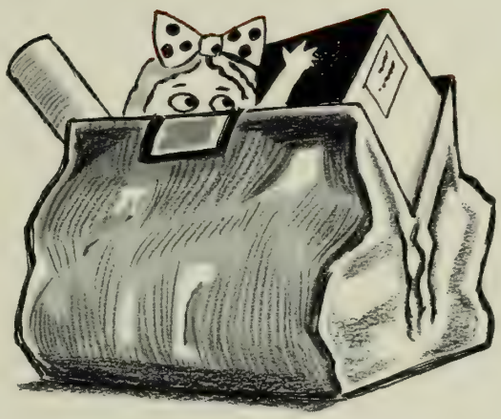
Hi-Jack: A discreet transponder code has been established to alert ARTC during attempted Hi-Jackings. See Special Notices in the 15 Oct issue of the IFR-S and FLIP Planning, Section II. ★



THE SCOUT AWARD

(Quote from an incident report:) "Pull-off from strafing pass. The aircraft was climbing through about 3800 feet when the pilot saw a bird. He broke left to avoid it, but broke into another bird. This one hit the right forward windscreen and created a ten-inch diameter hole in the plexiglas. Pilot and cockpit were littered with bird debris from some unidentifiable black bird. Pilot was flying with helmet visor down which undoubtedly prevented serious injury. Aircraft landed without further incident."

This pilot was prepared and it saved his eyes. Are you prepared to save yours? ★



MISUSE OF HELMET BAGS

Recently, a crewman received minor burns on his right cheek from acid which leaked from a flashlight battery onto his oxygen mask. He had used the helmet bag to store his flashlight between flights. Just before the last flight, the acid leaked from the flashlight batteries (marked "leakproof") onto the mask. He was unaware of what happened and experienced severe discomfort and burns after wearing the mask for a few hours. ★

(TIG Brief, No. 16)

Ops topics

CONTINUED

HOW BIG?

A recent incident has activated the gears in our cranium toward passing on this warning note: Beware, if you are out of the norm sizewise (what a word!).

The incident involved a canopy loss by a T-37. The investigator was of the opinion that the student pilot's size was the critical factor. Being very short, he flew with the seat full up, which exposed the canopy handle to his left elbow.

Over the years there have been numerous incidents, and probably some accidents, due to pilots being either extra tall, extra short, or just plain big. So, if you fit into one of those categories, take stock and make sure your size won't adversely affect some system in your airplane. ★

DRAGGIN' IN A T-29

There are many old stories about pilots landing at the wrong place. We thought that was just about a thing of the past, what with modern communications, runway identifiers and all, but apparently we were wrong. It happened just a short time ago. We're not going to fault the pilot on this one because we weren't in the cockpit. Here's a brief of the report.

The T-29 was enroute to Corpus Christi, Texas, International Airport for a parts pickup and was vectored to a long final for runway 35. Weather was good with viz given at 15 miles; however, the crew said that haze made it more like five miles. The crew spotted a runway but, too late for a go-around, realized it wasn't the right one. Before they could stop, the right wing struck some poles alongside the "runway."

It turned out that where they landed was a closed airport 3.5 miles south of Corpus Christi International. It is now being used as a drag strip. The strip was the former 17-35 runway 4100' X 60'. The place also has a 13-31 strip the same as Corpus Christi where it is NOTAMed closed for construction.

Perhaps by the time this appears in print the problem will be somehow solved. Anyway, if you should have to go to Corpus Christi, remember the drag strip. ★

OHR

Approximately ten minutes after power was applied on a B-52, the crew noted a strong odor of burning paper and cut power immediately. Then they looked and found an Aldis lamp face down on some paper aircraft records. A load adjuster (slip stick) was on top of the Aldis lamp, depressing the switch and the heat of the illuminated lamp caused the paper to smolder.

It was suggested that since the Aldis lamp is used so infrequently, it should not be left plugged in. Also that personnel insure that the Aldis lamp is properly stowed when not in use. Good advice for all equipment. ★

HEADS UP FLYING

So many incident and accident reports contain examples of human failure that it's refreshing to see one that gives credit for a job well done. One of these rare ones showed up the other day and we're passing it along as an example of heads up flying by a guy who acted promptly in a very sticky situation and saved an airplane.

The flight of two F-100s had just got gear and flaps up after takeoff when the wingman advised Lead of a fire just aft of the eyelids. Just as Lead pulled the throttle out of A/B the aft section overheat light came on. He further reduced throttle and the light went out and Wing confirmed no fire. Lead declared an emergency, made a straight-in and landed. After clearing the runway, the pilot shut down and exited.

There had been a fire at the base of the spray bar extensions, hot enough to melt pieces of the eyelids which ignited grass fires near the departure end of the runway.

Both the alert wingman and Lead can take credit for saving an aircraft. ★

☆ U.S. GOVERNMENT PRINTING OFFICE 1970 431-459/4

UNITED STATES AIR FORCE

WELL DONE AWARD

Presented for outstanding airmanship and professional performance during a hazardous situation and for a significant contribution to the United States Air Force Accident Prevention Program.



(L to R)

Capt Paul Katsuki
Aircraft Commander

Capt James R. Misken
Copilot

Maj Donald M. Rieke
Navigator

TSgt George S. Thompson
Flight Engineer

TSgt Carl T. Kleusch
Loadmaster

314th Tactical Airlift Wing, APO San Francisco 96319

On 12 February 1970, the C-130 departed Da Nang with 69 passengers and a basic crew of five for Hue Phu Bai. Because of weather a GCA was made into Hue where the first 1000 feet of runway was closed for construction. The aircraft touched down on centerline approximately 2000 feet down the runway and the nose gear was lowered onto the runway. Captain Katsuki retarded the power to ground idle, paused and applied reverse thrust, but the Nr 4 prop hung up on the low pitch stop and did not enter the reverse range. As the propellers went into reverse, the aircraft swerved violently to the left and the left main gear went off the aluminum planking onto the asphalt at the left edge of the runway. Captain Katsuki immediately applied right rudder and brought the throttles out of reverse. The aircraft then swerved back to the right and the right main gear went off the aluminum and onto the asphalt on the right side of the runway.

The pilot judged that there was insufficient runway remaining and decided to go around. He applied max power on all engines, called for 50 per cent flaps and flew the aircraft off; however, directional control became extremely difficult. Captain Katsuki noted an increasingly loud, high pitched sound and established the fact that he had a runaway propeller. But when he called for emergency engine shutdown on Nr 4 engine, the propeller did not feather and the RPM continued to increase. After finding that the prop would not feather, the crew reset the fire handle to restore oil to the engine and Capt Katsuki elected to divert to Da Nang.

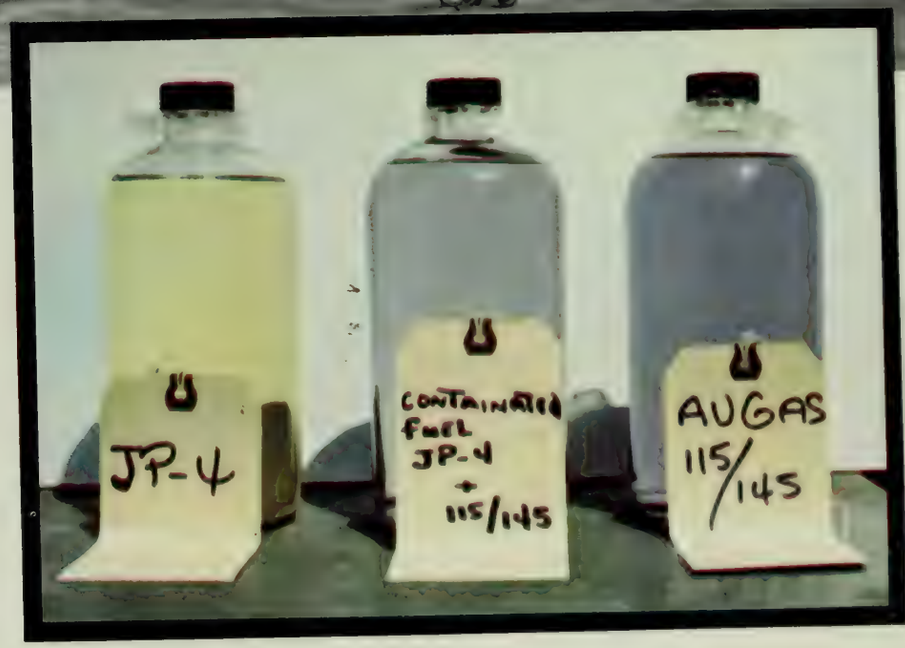
With the aircraft almost uncontrollable, maintaining a slow, flat, right turn, the pilots' main concern was to get enough airspeed to regain full control and to get enough altitude to clear the terrain. Unable to comply with Hue Approach vectors and climb instructions, the pilot depended entirely on the navigator for terrain avoidance and set-up a straight-in to Da Nang. At the start of the descent into Da Nang, he was able to reduce power on Nr 1 engine to enhance directional control and still maintain airspeed. He held 140 knots until just prior to touchdown and flew the aircraft onto the runway. When the propeller dome assembly was disassembled, a crack was found on the entire inner circumference of the propeller piston.

Captain Katsuki's superb pilot skills, supported by outstanding performance by each man on the crew, made it possible for investigators to determine the exact cause of the malfunction, and possibly saved many lives and an aircraft. WELL DONE! ★



know the difference

A MISTAKE COULD BE FATAL



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FLYS

UNITED STATES AIR FORCE • JANUARY 1971

Aerospace SAFETY



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JANUARY 1971 AFRP 127-2 VOLUME 27 NUMBER 1

WORRIED?

WHO?

ME?

Col Richard A. Yoder, Deputy Commander Materiel, 62 Military Airlift Wing, McChord AFB, Wash.

How often have you heard it said: "Why worry?", or "Don't worry about it." Unless we are discussing yesterday, I say that is wrong. We need to worry, because that's the way we solve problems, make improvements and avoid complacency.

One of my former commanders was extremely conscious of the dangers of complacency as it applied to aircraft operations and maintenance, as well as all support areas. He described complacency as "satisfaction to the point of stultification." So, if you don't want to be stultified—worry!

Now, if you are going to worry, you might as well do a good job of it. There is a maximum of 24 hours of worry time available to each of us every day. Then when you subtract things like eating and sleeping, doing a good job, going to meetings, having a good time, etc., they really cut into your available worry time to where you may end up with only a few hours a day. So, it is essential that you use your worry time efficiently and effectively.

Commanders are especially good worriers. They can worry a little bit about a lot of things and start a whole chain reaction of worrying among their subordinates. For example: If the comander worries about the young airman, immediately the first sergeant and senior NCOs start worrying also. If he worries about mission delays, then Operations, Traffic, Maintenance, Supply and support functional managers start worrying, too. When he worries about base appearance a whole myriad of area managers start worrying. And with all this concentrated worrying, things just have to improve.

Another facet of quality worrying is the time factor. It is my view that the time to worry about anything is *before* the fact. It is only then that something can be done—changes made. And, really, that's the result we want from worrying —change for the better, problems resolved, and complacency avoided. So, if you subscribe to my thesis you will not waste worry time on yesterday, but really zero in on tomorrow. Yesterday is history and we can learn much from it—but we can't change it, so why worry? Tomorrow is the future and our golden opportunity to improve.

Worry a little bit. It's good for you! ★

landing fighter aircraft



Col Edward P. McNeff
Commander, 835th Air Division,
McConnell AFB, Kans.

Dear Fellow Fighter Pilots

Every flight terminates in some kind of landing, and a short tour in mobile will show our landings come in many variations. Unfortunately, some end in tragedy. So the age-old problem of landing fighter aircraft safely is still very much alive.

Out of a total of 190 fighter aircraft accidents within TAC, USAFE, and PACAF during 1969 and through 21 August 1970, 22 were caused by pilot error during some phase of landing. These accidents happened during both single ship and formation landings.

So it goes, with little or no room for debate, that, in spite of all the

data published and all the flying courses taught, far too many techniques and procedures for landing jet fighters have been only momentarily remembered, forgotten in part, or simply ignored.

Accidents are pure losses of man power and equipment. But they don't have to be total losses if the knowledge acquired from them is applied toward preventing others. Learn from the mistakes of others, because no one pilot has enough lives and flying years to make them all himself.

Let's discuss separately the two classifications of fighter landing accidents which still plague us.

SINGLE SHIP

Accidents during single ship landings cover a multitude of improper techniques. These consist of being too high on airspeed and altitude, too low on airspeed and altitude, failure to use landing aids, or a combination of any of these and others unmentioned.

VASI is one of the greatest aids provided for landing aircraft since the GCA and ILS, particularly for VFR landing patterns. Although the IFR Supplement, dated 15 October 1970, shows 18 USAF bases in the U.S. without VASI, accidents reflect that where VASI is installed it is still grossly misused or ignored completely. There have been instances where pilots were asked if they used VASI indications during landings and they replied in the negative, or, more surprisingly, some could not positively state that they actually saw the VASI lights.

It is realized that VASI indications do not satisfactorily accommodate every aircraft of varied landing configurations and airspeeds to an optimum point of touchdown. But a pilot's sense of judgment, which he supposedly maintains along with proficiency, should provide him with the necessary insight to judge just how far on final approach he should use the VASI before eliminating it from his cross check. The fact that VASI provides glide slope guidance to parallel or closely parallel those of GCA and ILS is by design. This means that, wherever a pilot makes an IFR or VFR approach in the U. S., using any one of the above-mentioned devices, he can expect a glide slope reasonably close to those at other installations. This standardization serves two useful purposes: aid the pilot and prevent accidents.

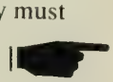
Drag chute complacency has taken an unwarranted toll in our landing accidents. Drag chutes came into being with the advent of aircraft that land at high rates of speed and/or heavy gross weights. The intent of drag chutes, to aid in decelerating aircraft to preserve tires and brakes, has too often been changed by pilots to that of salvaging poor landings created by bad approaches. This practice is hard on tires and brakes and sets the stage for other serious damages.

It appears that numerous pilots continue to ignore one of the basic rules for landing high speed aircraft equipped with drag chutes. The rule, "treat every landing as if it's going to be a no-chute," is just as valid as it ever was.

Improper techniques employed during landings on wet runways have also resulted in numerous accidents. Many aircraft have failed to stop on the runway and overran the far end (unless barrier engagement was made) where they were badly damaged. To land on a wet runway and suddenly experience your flying machine hydroplaning is nothing new, and is a definite possibility. We don't know yet all there is to know about hydroplaning, but sound recommended precautions do exist. First, if there is a heavy downpour, consider holding until the water drains from the runway. If conditions do not improve to your satisfaction, serious consideration should be given to diverting to an alternate with more favorable conditions. Second, once you decide to land, use whatever aids are available to assist you in aligning your aircraft with the optimum touchdown point. Remember, when you are finally committed to landing, the runway behind you serves no purpose. Third, apply maximum aerodynamic braking followed by maximum effective braking as recommended for your particular aircraft.

FORMATION

Mission requirements under various conditions clearly dictate the need for formation landings. While this need has decreased, a fighter pilot must maintain proficiency. It is obvious from the outset that both the flight leader and the wingman have definite responsibilities. Both must remain constantly aware that, as pilots of jet aircraft, they must



CONTINUED

anticipate and remain well ahead of any situation to avoid tragedy. This is especially true for landing jet fighters in formation. The following are firmly established, basic guide lines that must be emphasized in all briefings for formation landings.

FIGHT LEADER'S RESPONSIBILITIES:

His first obligation is to determine (1) if conditions are suitable to make a formation landing, (2) that a requirement exists, followed by (3) insuring that the wingman is on the upwind side. Ordinarily, Lead should refrain from using speed brakes on final approach. This allows the wingman to carry a higher power setting than the leader for quick engine response. Smooth throttle and control movements are mandatory throughout the entire approach. If flight to the optimum touchdown point cannot be made with smooth throttle and control movements, the approach should be aborted. Final approach airspeed is to be based on the heavier aircraft for weight and wind factors. After touchdown, delay chute momentarily to allow wingman to deploy his.

WINGMAN RESPONSIBILITIES:

He also must be proficient and smooth. The position to hold on final is basically the same as that in normal close formation, but flying at least level with, or stacked slightly higher than, the leader. This is to provide for simultaneous touchdown and to keep the unwary wingman from landing in the trees or the overrun. This position should be held all the way to touchdown, with the wingman refraining from dropping back when the runway is in sight. Even though the runway is in sight, formation should be flown to the point of touchdown. Deploy drag chute immediately after touchdown. Although not required, if speed brakes are used it will necessitate additional power providing greater lift and aircraft control. It will also lessen the tendency to move in front of the leader at power reduction.

Two recent incidents involved formation landings. In one case, the wingman dropped low and landed in the overrun, knocking his nose wheel off. We were most lucky to avoid a catastrophe there. On another occasion two Phantoms landed in formation and the wingman jousted the leader for position by knocking wingtips together. Lucky again.

Many of the accidents that occur on a slippery runway also involve crosswinds. If there is any question about such adverse conditions, simply avoid making formation landings or takeoffs. Plan your approach to land on the upwind side of the runway and be especially careful in your drag chute operation. Once deployed, jettisoning it to reduce weather-vaning may be necessary.

In summary then, there is nothing really new about landing jet aircraft singly or in formation. So one can justifiably ask the question, why do we continue to have landing accidents? We may never know all the answers to that question. However, it is readily apparent that there is complacency and an obvious lack of the necessary professionalism from the supervisory level down to the junior wingman. There is a definite need to refocus our attitudes and training programs toward this problem and strive to become TRUE PROFESSIONALS. ★



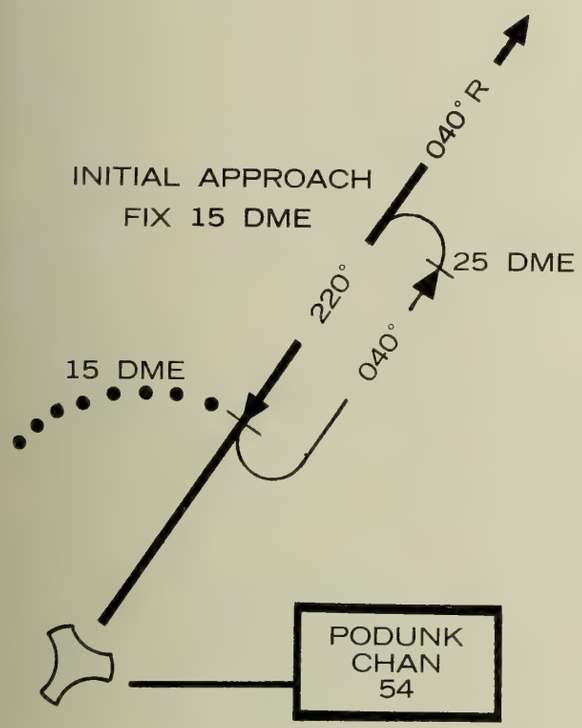
Colonel Vere Short, Deputy Commander for Operations for the 443rd Military Airlift Wing, Altus AFB, Okla., is presented a plaque by General Jack J. Catton, Commander of the Military Airlift Command, recognizing Colonel Short's record of 25,000 accident-free flying hours. Looking on during the presentation is Colonel George Maurice Wentsch, Wing Commander.

THE I.P.I.S. APPROACH

By the USAF Instrument Pilot Instructor School, (ATC) Randolph AFB, Texas

TACAN ARC PENETRATION

Q Some TACAN instrument approaches have an IAF which is formed by the intersection of a holding radial and the penetration/approach ARC. Consider yourself holding in the example below. After being cleared for the approach, must you cross the IAF, or do you lead the turn to the ARC; secondly, when can you begin descent?



A You should apply a lead point and turn on the ARC. Techniques for determining the lead point for 90 degree ARC interceptions are in AFM 51-37. Descent may be started when the aircraft is established on an *intercept* to the ARC and is abeam or past the IAF in *relation to the initial penetration track*. In this case you are past the IAF and on an intercept to the ARC as soon as you start the turn.

IFR SUPPLEMENT

Q "Reduced Runway Standards in Effect" are noted in the IFR Supplement Remarks section for some airfields (example, Andrews AFB). Just what does that mean?

A By reducing runway standards, the tower controller may allow an aircraft to land although another landing aircraft has not cleared the runway.

TRY THIS QUIZ

1. You are planning an IFR flight to Brennan AFB. An alternate will be required if the weather is:
 A. 3000 and 3.
 B. 3000 and 5, intermittent 3 miles with blowing dust.
 C. 5000 and 3, intermittent 2 miles with haze.
 D. None of the above.
2. You are holding in a published TACAN holding pattern where the IAF and holding fix are not co-located. Two-way radio failure procedures require you to:
 A. Be at the IAF at your EAC.
 B. Leave the holding fix at your EAC.
 C. Leave the IAF at your EFC.
3. You are at FL 230 proceeding to an IAF which has FL 200 as the initial penetration altitude. ATC clears you for the approach. You may descend to FL 200:
 A. At your discretion; however, you should call, "Leaving FL 230."
 B. Once you are in the holding airspace.
 C. At the IAF in the holding pattern.
4. You have been cleared for an approach and are approaching the IAF on a course which is 180° from the penetration course. You should:
 A. Use the holding airspace to conveniently align yourself with the penetration course.
 B. Turn the shortest direction to the penetration course immediately after passing the IAF.
 C. Either A or B.

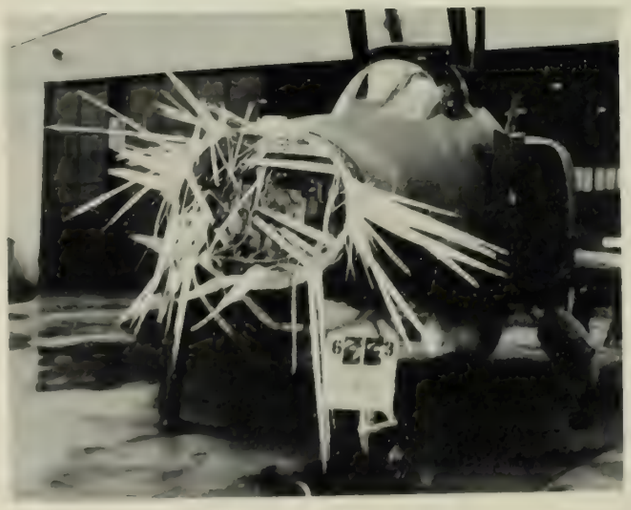
NOTE

Whenever ATC requests your distance from a VORTAC, VOR/DME or TACAN—give your DME reading; do not subtract slant range from the DME reading.

ANSWERS TO QUIZ: 1.C; 2.A; 3.A; 4.B

P.S. If you would like to have copies of all the IPIS Approach articles since inception, write to the USAF IPIS (FTYI), Randolph AFB, Texas 78148. ★

LIGHTNING does STRIKE



"Lightning never strikes twice i
the same place."

That old saying has lon
since been disproved. But leave
to a couple of Air Force types
give it a new twist. They moved th
place—the place being an RF-4C

On climbout while passin
through 2000 feet, they got a ligh
ning strike that knocked out th
interphone and the inertial nav sy
tem. They climbed to VFR on to
at FL 245 and declared an eme
gency. Another RF crew heard th
emergency call and looked over th

TWICE

aircraft, reporting only a brown smudge on the side of the radome.

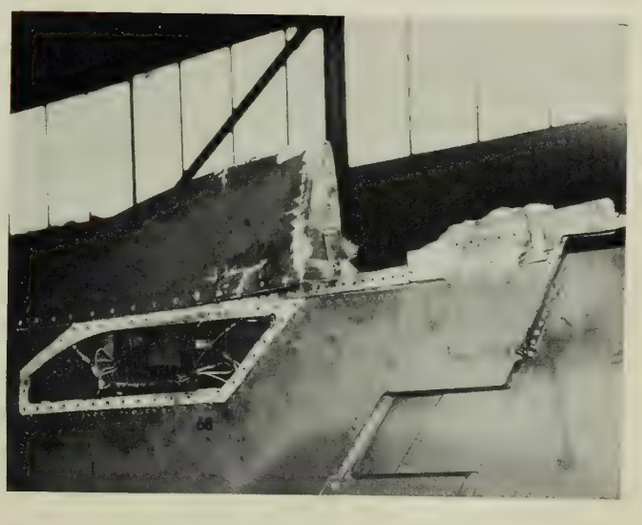
The struck aircraft then started a single ship random radar approach to home base, but on downwind at 3000 feet they received another, more serious strike. This one knocked off most of the radome and took out the pitot system, angle of attack and generators.

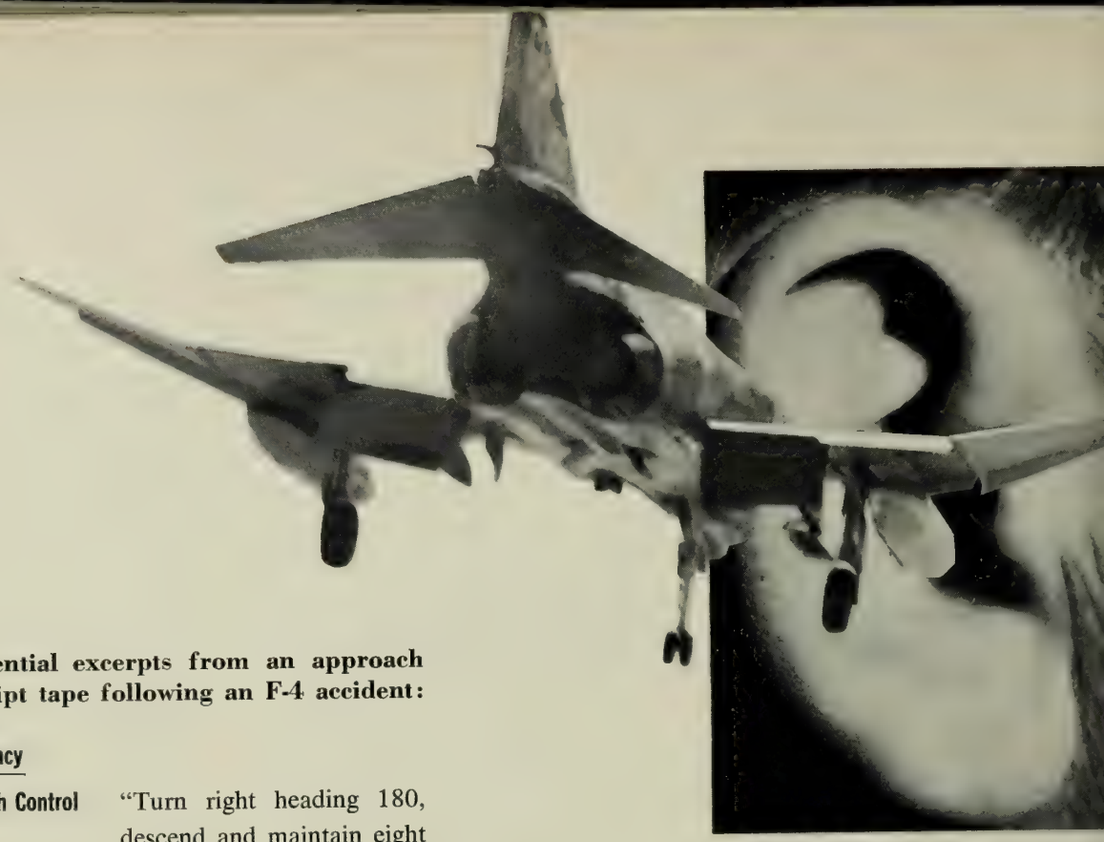
The generators were recycled and they climbed back on top and called MAY DAY on guard. Another RF crew took a look and gave them the bad news: radome and a large piece of the vertical stabilizer missing.

Now the supervisor of flying advised a landing at a nearby base where the weather was better. The crew joined up on the other RF and made a no-flapper at 190-200 knots to an approach end arrestment.

The aircraft was immediately impounded and held in a hangar until investigators could take a look at it. What they saw was appalling. The radome was destroyed and the antenna dish blown from its mounting. All but one camera window had been blown out. Debris had entered the engines, damaging the inlet ramps and doing minor damage to the engines. Other debris struck and damaged the left speed brake as well as the external fuel tanks and leading edge flaps. A small hole was burned in the trailing edge of the left outer wing section. The most serious damage, however, was to the vertical stabilizer. The rear section of the upper cap was torn away. Several other sections were buckled and warped. Wiring was burned and the main spar and rib had been split.

In case you're wondering about the weather, the forecast called for a few isolated thunderstorms. The first strike was the only evidence of a T-storm seen by the crew, who saw only three during their entire flight. In fact, of the six other aircraft that departed on the same course, none experienced any T-storm activity. Apparently active cells were imbedded in stratus clouds and, therefore, not visible from the ground. ★





LIST

Below are essential excerpts from an approach control transcript tape following an F-4 accident:

Time	Agency	
1929:38	Approach Control	"Turn right heading 180, descend and maintain eight thousand."
1929:42	Aircraft	"Right 180 out of 15 thousand for two thousand." (Aircraft's readback was interrupted by a transmission from another aircraft and not acknowledged by approach control.)
1931:08	Aircraft	"Steady 180 and passing 10 thousand for two thousand."
1931:11	Approach Control	"Roger."
1931:22	Approach Control	"Your position 12 miles southwest of airport, maintain eight thousand feet."
1931:30	Aircraft	"Roger, passing nine for *two.*" (This transmission was not acknowledged by approach control.)
1933:05	Approach Control	"Your position 19 miles southwest of the airport turn right 200 for slight pattern extension."

Radar and radio contact was lost at this time—

The previous transmissions occurred between an approach control agency and the crew of an F-4 during the final portion of what should have been a routine IFR radar penetration and landing at destination.

The single aircraft departed home base for an instrument training/cross-country flight to an Air Force base which the pilot had flown into twice within the previous 11 days. The backseater had also worked the same approach control three times previous to the accident. The biggest question concerning the mishap is why was the crew so convinced their descent altitude was 2000′ instead of 8000′? There was a hint of radio receiver difficulty on only one transmission which was apparently rectified by a radio check which was further substantiated by subsequent transmissions.

When approach control gave instructions to turn right 180, descend and maintain eight thousand the read back from the aircraft stated the correct heading but

HEARING BUT NOT ENING?

2000′ as the descent altitude. This reply was partially cut out by a transmission from another aircraft and the approach controller failed to acknowledge it. From this point until collision with the ground the crew obviously had the 2000′ descent altitude locked into their minds.

* * * * * *

The above is quoted from a report by another service on a fatal accident. Similar events in the past in which Air Force crews were involved raises the question of why?

We know that people frequently see not reality but what they expect or want to see. This no doubt accounts for some misreadings of altimeter indications. We are also selective listeners—either hearing what is expected, or completely tuning out. Even when we hear correctly and repeat instructions, warnings or routine transmissions we sometimes do the opposite or simply reply parrot-like without performing a required check or function. An example would be the pilot who replies to the controller, "gear down," and proceeds to land on the belly.

We know from experience that fatigue, anxiety or preoccupation are conducive to such reactions. Familiarity, which frequently leads to complacency, is also a factor. Usually, however, there are stimuli which tend to alert us. These stimuli take many forms, the most obvious of which probably are those which tend to alarm us. A more subtle one would be conditions that require extra care or certain precautions simply because they are there.

In the accident described above, there was a stimulus that seemingly would have kept this crew more conscious of their situation. The minimum safe altitude within 25 miles of the airport is specified on the approach plate as 7900 feet. Also, more than 60 per cent of their route was over mountains. Therefore, it would seem that terrain clearance would have been uppermost in their minds. It may have been, however, that complacency set in because they were under a radar controlled approach.

Accident investigators concluded that the cause factor was human error on the part of both the crew and the controller. The important thing we can learn from this tragic accident is that humans are susceptible to these mental lapses. We've all experienced this phenomenon but most of us have been lucky. Unfortunately there have been those who ran out of luck.

Recognition of this human trait is essential to controlling it. This is particularly true in the three dimensional environment in which aircraft operations are conducted, especially at night and during IFR weather. ★

sleeping beauty

It is a pretty little thing with its little blue and white lines and neat lettering. You turn it over, and around, and look at it from every direction and think: how neat, substantial, solid and trustworthy it is. Nothing could go wrong with such a well-packaged article.

Don't you believe it! It is like a snake! If you get careless, mistreat it or handle it too much, it will bite, or even kill. It is an accident waiting to happen simply because it is an interface or connection which, logically, is always where something can fall through the crack. It's a sleeper. It is an electrical connector.

What makes it dangerous are bad assumptions. The engineers seem to have forgotten that if it is remotely possible for something to go wrong, it probably will. They *assumed* that because the pretty straight lines on their drawings aligned the pins and sockets within a few thousandths of an inch that they would always stay there. They *assumed* that the proper manufacturing procedures called out on the drawing would always be followed. Add a few more assumptions made by the depot repair and field maintenance troops, and you arrive at a sick situation.

Here are some real sick situations: Ground launched missiles fail to leave the ground, air launched missiles launch on the ground, missile payloads inadvertently propel themselves when the booster refuses to go, aircraft drop out of the sky, and worst of all, people are killed because the ejection system didn't work properly, or are electrified to the ultimate.

Imagine, if you will, an assembly consisting of a few generals, a few more colonels, a bunch of lieutenant colonels, and a whole band of "ordinaries" standing not too far from a big, exciting hole, waiting. They wait, expectantly and impatiently, to see the launch of a real true life, roaring, fire-belching bird. The countdown goes as scheduled, but that's all that happens. No bird. No smoke. No nothing. Why? A bad umbilical (electrical) connector.

Now, how would you feel if you were a pilot, in the cockpit of an F-4 fully loaded for a combat mission, and you are going through the preliminaries when suddenly one of



your missiles goes through a nearby bunker? You think you feel bad? How about that poor airman out there lying motionless on the ramp? He will spend a few months in the hospital. What happened? A fault in the connector between the aircraft and the launcher betrayed everyone involved. Stray voltage checks had been made. The first check indicated something wrong. A later check indicated that everything was in order, so the airman assumed that it was. But when he removed the safing device, that pretty little thing bit him—bad!

How much money did we lose when, for no apparent reason, a high altitude payload decided to complete the mission without the help of the booster? How come? Prelaunch preparations and countdown proceeded normally until T-zero when the firing voltage was

James L. Sparkman, Directorate of Aerospace Safety



FIGURE 1



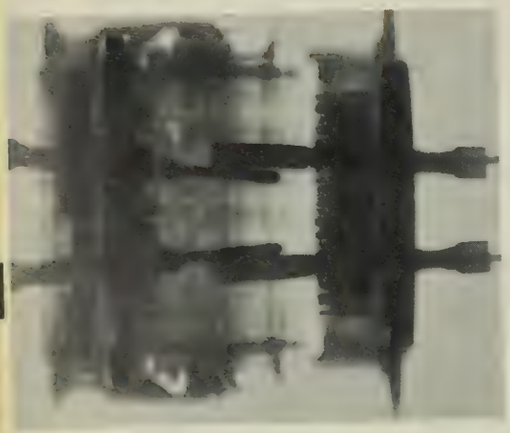
FIGURE 2



FIGURE 3



FIGURE 4



applied. The booster refused, but after a 165 second scheduled time delay, the payload decided to go anyway. It went 30 yards downrange. Investigation revealed that a pushed back pin in the male portion of a connector had caused a fault in the system. Figure 1 is a photo of a connector showing it can happen.

Talk to the crew of an F-4 who found themselves in a situation where practically nothing of real value in the cockpit worked right. It's enough to get a master caution light with a fuel level low light, but when you—lose communication, get an inertial navigation system light, see blinking generator lights and bus tie lights, hear a loud thump, lose pressurization, get a tumbled attitude indicator, notice horizontal situation indicator headings varying all over and feel sloppy controls—the situation gets almost intolerable.

With all this, they were faced with a penetration, but they pressed on only to find that the throttles and control sticks had a personality all their own. They wanted to move back and forth of their own free will. Now add smoke in the cockpit.

This wasn't their day. They couldn't find a place to dump the external wing tanks and two other fighters tightened the screws further by getting in the way. Somehow they pressed on through a second letdown only to have afterburner trouble in the pattern, then gear and flap troubles with a tendency to roll on final.

The navigator ejected after touchdown 760 feet from the overrun. Maybe the fact that they had just gone through a tree and the perimeter fence got on his nerves. He couldn't take anymore.

Now ask this crew what they think of depot level assembly of connector plugs. The little beauty that caused their problems is shown in Figure 2, the aircraft in Figure 3. The depot level quality control people plus others assumed that the connector was put together correctly.

Have you had enough examples? Hold for one more. Look at Figure 4 real hard and remember it! That one was involved in the electrocution of a man. One of its contacts was out of place and he failed to ground it properly.

If you still aren't convinced that you must pay a lot of attention to these sleeping beauties and treat them gently and with a lot of respect, here are the statistics. In those mishaps where an electrical factor has been involved, roughly 25 per cent involved connectors as either the primary or contributing cause. During the period 1969 to date, we know of 114 aircraft, 10 missile, and 6 explosives mishaps involving connectors. These are conservative figures. Many incidents are either labeled "cause unknown" or provide insufficient detail.

It is probable that if the connectors were looked at more closely during the investigation we would find a lot more mishaps attributable to them. Validity was recently added to this statement by an EUMR submitted on AIM-4D8 missiles. Quote "Six out of 33 AIM-4D-8 missiles inspected had male and/or female pins located in center splice connector P/N 247601 and P/N 248603 defective. (TO 21M-AIM4D-4, Figure 26, Index 41, and Figure 27, Index 14, respectively.) The pins had broken loose from the phenolic material of the connectors. This condition results in pins that are partially pushed back which may result in continuity being broken. . ."

The problems involved are simple and boil down to about seven: (1) bent pins, (2) pushed back receptacles and pins, (3) pins slip, (4) frayed or loose wire at or in the rear of the connector, (5) shorting at the connector interface due to moisture and/or corrosion, (6) foreign materials such as solder cause various kinds of malfunctions, and (7) the connector retainers become loose and allow separation.

Fortunately, a better connector design that will help alleviate the problems is on the way. But don't hold your breath while waiting for it. Take all those good quality control, maintenance, and inspection actions which you know are needed. Whatever you do, don't become careless with this little bundle of dynamite. ★

(The author wishes to thank Mr. Harry King, In-service Engineering Division, SMAMA, for providing information upon which parts of this article are based.)

Aircraft Seat Belts

Maj John P. Garbe, Directorate of Aerospace Safety

A recent incident involving a passenger-carrying aircraft has disclosed a practice that can be injurious to passengers' health.

The aircraft was a routine passenger-carrying mission flying in and out of cirrus clouds. Cloud buildup was displayed on the aircraft's radar scope; however, lightning had not been observed which would indicate a thunderstorm. As a precautionary measure the pilot turned on the "fasten seat belt" sign and made an announcement over the aircraft PA system to observe the seat belt sign. Shortly thereafter the aircraft encountered turbulence that was reported as moderate to severe.

Unfortunately several persons had ignored the announcement as well as the sign. As a result, they found themselves bouncing off the ceiling of the aircraft. The ceiling remained intact but there were several dented heads and one broken leg.

All of these injuries were preventable. The illumination of the seat belt sign coupled with the PA announcement was sufficient warning for everyone to buckle-up.

There has not been a system devised yet that will accurately forecast and measure the severity of turbulence; let's reduce the impact by fastening seat belts when instructed to do so.

FOD Picker

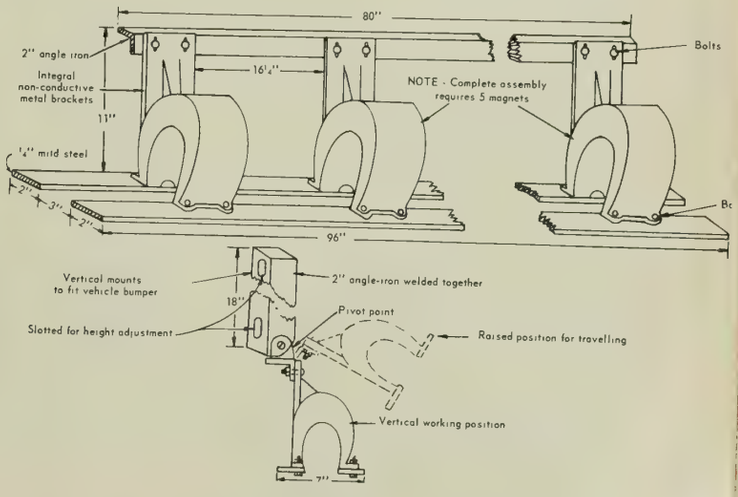
This magnetic sweeper has been added to the anti-FOD campaign at CFB Chatham. It is the result of inexpensive local manufacture using permanent magnets which are normally converted to scrap metal. The magnets are obtained from Magnetron Tubes used in ground radar equipment.

Best results are achieved with the bar set at 1 to 1½ inches off the ground, at 5-7 miles per hour. Trials in this configuration have shown excellent effectiveness with fallen bristles and most metallic FOD, including metal filings generated by snow and ice removal equipment scraper blades and shoes. The magnet bar can be quickly cleaned off by hand or with a stiff broom.

A one-way pivot anchor point enables the magnet bar to be raised well off the ground when traveling over rough terrain. ★

Reprinted from Canadian Forces Flight Comment







We have had numerous requests from the field as to what criteria Rex uses for the evaluation of a base's transient facilities. There are a number of reasons why a base receives an evaluation. First of all, Rex or one of his representatives might conduct an incidental evaluation while on a cross-country. Second, the evaluation might be planned due to a number of complaints from the traveling Air Force that they are not receiving quality service from a base that may or may not be on the Rex Recommended list.

In any event the evaluation begins when the inbound aircraft is turned over to approach control and is concluded when it is outbound and leaves the departure control frequency. True, this covers many functions and we are aware that some of the factors evaluated are outside the control of the base. However, in many cases problems can be resolved when liaison is established between, for example, the base and an FAA approach control.

The radar control facility serving the base is judged on its ability to professionally handle traffic. For example, when a controller issues instructions to an aircraft, he must be positive that the proper pilot received the instructions. No small number of accidents have occurred because of a mix-up on just who was supposed to have descended and who was supposed to have maintained altitude. Frequently the evaluation pilot will simulate an emergency to check procedures, if such an action does not interfere with traffic.

Contact with the tower on a rollout from GCA or ILS should not require more than one radio call unless something is wrong with the equipment. The tower operators should have you in sight and be awaiting your call. "Turn right at the next taxiway" is okay, but much better if "at the three thousand foot marker" is added. If a follow-me is not immediately available, then ground control instructions must be specific—not just, "cleared to the ramp."

One of the most important yard sticks used by our evaluators is how quickly fuel is available if the mission dictates a quick turn-around. In most cases the request for this rapid service is indicated on the 175 and confirmed by contacting the "Pilot to Dispatcher" frequency before landing. When the pilot goes through this exercise, he should reasonably expect a fuel truck to be waiting unless there are extenuating circumstances. The same is true if maintenance is required and operations has been notified. If a radio needs attention, why can't a comm man be standing by?

We know that in some cases your transient ramp is full but why, when ample space is available, is an aircraft requesting a quick turn parked a ten-minute drive from operations? Some of the more prevalent complaints: "after installing the chocks everyone disappeared"; "no ladder available although Ops was aware of our requirement at least 30 minutes before arrival"; "no transportation available for a Code 7 though his deplaning was noted on the 175".

If a pilot has to RON at a base he expects such basic services as adequate food and quarters. Fatigue plays its insidious role in many of our accidents, so a good night's rest is a must. This is a little difficult if billeted with your copilot. He may be your best friend but this doesn't keep him from being a loud snorer. What may even be worse, is being sound asleep in a two-man room which is invaded at 0300 by a crewmember from another aircraft trying to find some place to lay his weary head.

Many pilots out on a cross-country have a tight schedule, often subject to change at any moment. It may be necessary for his Ops officer to contact him and alter his plans. Therefore, it is a must that a paging or phone system be established to provide this service.

Returning to the flightline the next morning we find another standard complaint—forms improperly filled out. In one instance, the wrong fuel quantity was entered. These little items hint that someone is not doing his job properly.

When requesting our clearance,



we have gotten fairly used to hearing the phraseology, "stand by for your departure time" or "no delay expected." The last remark indicates that we should expect to have our clearance within 15 minutes. If you're in a recip it's at best irritating to wait 30 minutes, but in a jet it could result in a back-to-the-ramp act to top off.

To complete the cycle, taxi information to the active should assume the pilot has never landed at your base and directions should be given accordingly. With the handoff to Center the evaluation is complete.

There are a number of other things that impress Rex. The cheerful attitude of the Transient personnel, the willingness of Base Ops dispatchers to provide information, prompt transportation when required, neat and comfortable quarters, and last but certainly not least, the availability of a clean place to eat at any hour.

Rex has been swamped with evaluations of various bases by you pilots, some of them complimentary, and some not so good. We do our best to insure that the base commander receives a copy of your kudos or complaints. If we find that complaints are the rule rather than the exception, we expect the base commander to take action to correct the discrepancies. If his base is on the Recommended list and no action is taken, we assume he has no interest in remaining on the list. As yet, we haven't found any commanders who were indifferent about their transient service. If problem areas do exist, in most cases the commander isn't aware of them, nor is he likely to be unless you let him or us know. So it's up to you, the traveling Air Force, to make your gripes known. If they are valid Rex is willing to bet something can be done to make your trips more pleasant. ★



REX RILEY

Transient Services Awar

LORING AFB	Limestone, Me.
McCLELLAN AFB	Sacramento, Calif.
MAXWELL AFB	Montgomery, Ala.
HAMILTON AFB	Ignacio, Calif.
SCOTT AFB	Belleville, Ill.
RAMEY AFB	Puerto Rico
McCHORD AFB	Tacoma, Wash.
MYRTLE BEACH AFB	Myrtle Beach, S.C.
EGLIN AFB	Valparaiso, Fla.
FORBES AFB	Topeka, Kans.
MATHER AFB	Sacramento, Calif.
LAJES FIELD	Azores
SHEPPARD AFB	Wichita Falls, Tex.
MARCH AFB	Riverside, Calif.
GRISSOM AFB	Peru, Ind.
PERRIN AFB	Sherman, Tex.
CANNON AFB	Clovis, N.M.
HICKAM AFB	Hawaii
LUKE AFB	Phoenix, Ariz.
RANDOLPH AFB	San Antonio, Tex.
ROBINS AFB	Warner Robins, Ga.
TINKER AFB	Oklahoma City, Okla.
HILL AFB	Ogden, Utah
YOKOTA AB	Japan
SEYMOUR JOHNSON AFB	Goldsboro, N.C.
ENGLAND AFB	Alexandria, La.
MISAWA AB	Japan
KADENA AB	Okinawa
ELMENDORF AFB	Alaska
PETERSON FIELD	Colorado Springs, Colo.
RAMSTEIN AB	Germany
SHAW AFB	Sumter, S.C.
LITTLE ROCK AFB	Jacksonville, Ark.
TORREJON AB	Spain
TYNDALL AFB	Panama City, Fla.
OFFUTT AFB	Omaha, Nebr.
ITAZUKE AB	Japan
ANDREWS AFB	Washington, D.C.
McCONNELL AFB	Wichita, Kans.
NORTON AFB	San Bernardino, Calif.
BARKSDALE AFB	Shreveport, La.
HOMESTEAD AFB	Homestead, Fla.
CHANUTE AFB	Rantoul, Ill.
KIRTLAND AFB	Albuquerque, N.M.

SSE SYSTEM SAFETY ENGINEERING

MODERN APPROACH TO ACCIDENT PREVENTION

Col David M. Critchlow
Chief, System Safety Engineering Group,
Directorate of Aerospace Safety

You are working today in the safest period in Air Force history. Our accident rate has decreased in all areas, with notable reductions in aircraft and automobile accidents. Air Force safety personnel have established and implemented extensive training and educational programs to help protect you during the accomplishment of your everyday duties. Yet, those accidents that still persist are a continuing challenge that motivates us to look for new solutions to the accident prevention program. The newest of these concepts, and the one we look to for dramatic results in the future, is System Safety Engineering.

System Safety Engineering simply starts the accident prevention program on the designer's drawing board. System safety analysis techniques enable us to identify hazards early in the development program so that effective corrective action can be made with a minimum of cost, thereby preventing loss of equipment and injury to personnel. This approach can aid us in reducing design deficiencies such as selection of improper materials, improper design of the equipment for the environment in which it will operate, and also minimize design-induced pilot and maintenance errors.

It should be understood that the system safety effort is not a sudden harsh criticism of the capability of system designers. However, no matter how experienced, conscientious, or patriotic a designer might be, with the complexity of today's weapon systems, he cannot always envision his design's effect on other system components, or how they, in turn, may degrade the operation of his design. Thus, it becomes a responsibility of the contractor to insure that the system safety function is performed as part of the design before his item is received into the Air Force inventory. The fact that

Colonel Critchlow entered military service in 1942 as an Aviation Cadet and was commissioned in June 1944. He served in the Occupation of Germany, 1948-1949, where he flew 210 trips to Berlin on the Airlift. After serving in Germany, Colonel Critchlow flew as a test pilot, 1950-1956, and was Aircraft Commander of the B-52 that dropped the hydrogen bomb at Eniwetok, 21 May 1956. He served in DCS/Research and Development at the Pentagon, 1964-1968, and was subsequently assigned to Vietnam as Deputy Science Advisor to MCPV 1968-1969. Upon his return to the States, Colonel Critchlow was assigned as Deputy Director of Flight Test, Edwards AFB, California, 1969-1970, and moved to DIGIS as Chief of the System Safety Engineering Group 1 July 1970.



formal system safety programs are now contractually required on all new systems being developed will provide a better probability that the new system, when introduced into the inventory, will be significantly more hazard-free than are present systems.

The job of implementing a new engineering technique is a complex one. Presently, appropriate Air Force documents are in the process of revision to give Air Force agencies guidance in the management and conduct of system safety programs. Additionally, eight engineers are currently assigned to the Directorate of Aerospace Safety to provide system safety engineering guidance and assistance to all Air Force development agencies in performing the system safety effort. Now let's look at some results of applying these new ideas.

The first Air Force system to which system safety was applied was the Minuteman Missile. Most of the techniques used today, many of which have been improved upon, originated with this development. The documented results are impressive; the accident rate for the Minuteman has been a fraction of what it was for some of the earlier missiles. Naturally, not all of this improvement can be attributed to system safety but we believe it did make a substantial contribution.

The first aircraft to which System Safety Engineering was applied was the C-5A. Indications are that the contractor system safety efforts will be rewarding because of the analyses conducted early in the design phase. Over a hundred safety-related changes were made to the aircraft and its support equipment before it flew for the first time. While most of these changes were minor, some corrected potentially catastrophic deficiencies. For example, the cargo compartment in the C-5A is a double deck arrangement with the floor of the upper deck serving as the ceiling or overhead for the lower deck. This floor was a rigid structure and acted as a pressure seal between the two compartments. Additionally, the flight control cables were routed through this floor.

The system safety anaysis showed that if rapid decrompression occurred, the floor would buckle, due to the differential pressure, which would cause loss of control of the aircraft and probably result in an accident. The solution to this problem turned out to be very simple. Vents were provided through the floor to provide equalization of pressure between compartments in the event of an explosive decompression. We must point out that system safety is not the cure-all—as is evidenced by the C-5A accidents that have occurred. But, we do think that the number of hazards has been significantly reduced.

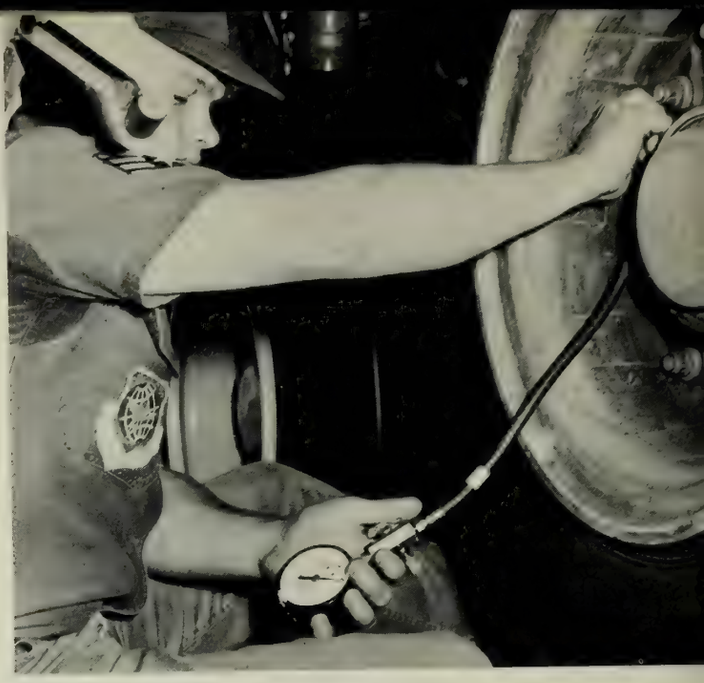
A system safety analysis on an air-launched missile currently in development also revealed an interesting situation. The preflight test safety analysis showed that an accidental rocket motor explosion could occur in a worst case condition with a probability of approximately one in a hundred. To preclude a catastrophic event of rocket motor explosion within the lethal envelope of the delivery aircraft, the test parameters were modified so that rocket motor ignition was delayed after release until it reached safe separation distance from the aircraft. Interestingly enough, subsequent motor explosion failures within a series of static firing tests were attributed to this very combination of fabrication and testing techniques. The problem has subsequently been corrected.

So much for examples, the point is that design intuition is no longer adequate to achieve a safe, effective weapon system. Some rather sophisticated special system safety analysis techniques have been developed and proven as necessary adjuncts to before-the-fact accident prevention.

Naturally, specialized training is required for personnel managing and performing these analyses. The Directorate of Aerospace Safety sponsors the System Safety Officers' Course at the University of Southern California and the System Safety Analysis Course at the University of Washington.

The future of System Safety Engineering is a bright one. Our Air Force systems are of rather complex design, but think of the worthwhile results this design safety discipline can achieve when applied to simpler equipment used by people every day. The many safety problems of common household appliances, TV sets, and even children's toys, can be solved during their design by the appropriate system safety analyses. With the increasing emphasis on pollution control, System Safety Engineering techniques will be almost mandatory to insure that the pollution control devices themselves do not fail due to design-induced failure conditions. The design of highway systems, cars, commercial aircraft, transportation of hazardous material for industrial uses, and low cost housing could all profit from the application of System Safety Engineering. For all of us, it will mean that we can live a little easier with less fear of injury and death from design-induced accidents.

The Air Force had a clear choice to make. Either implement System Safety Engineering or continue to suffer needlessly catastrophic accidents due to design deficiencies. We chose the System Safety Engineering route. ★



the simple time-consuming chore of servicing tires

"I'm Sergeant Daly. I run a transient maintenance crew and I want to talk about a problem we have with a relatively simple job that really bugs us, especially during a quick turnaround.

"Yesterday morning at 0830 I was notified that a C-141 would land at 1130 for a three-hour ground time. They were scheduled to onload 20,000 pounds of cargo and, after a through-flight inspection, would be on their way. One of the things I had to think about was that the change in gross weight would mean a change in tire pressure. Anyway, by the time the bird landed we had everything ready for what I thought would be a quick and efficient turnaround.

"With fuel servicing and cargo



OPPOSITE PAGE: Connecting gage is difficult and time consuming.

LEFT: If used properly service through gages will save time.

BELOW: If everything works perfectly they'll finish before the flight crew arrives.



loading complete, we proceeded with the rest of the through-flight, which included checking the tires. My guys aired up the tires and completed the job about 15 minutes before the flight crew arrived to start their walkaround prior to departure.

"I know this all sounds pretty routine and you are probably asking, 'what's the big problem?' Well, if you really analyze the situation you'll find that we are really crowding the maintenance crew with the tire checking and servicing bit, especially when we have one of those real short turnaround times. In case you don't know what I mean, let's take a look at the tire servicing procedures.

"To use the equipment authorized to service aircraft tires, the mechanic must first attach the gage to the valve stem and check the existing pressure. Then he removes the gage and connects the servicing line to the valve stem. Then either you need a second man to turn on the valve at the compressor or, if only one man is doing the job, he must run back and forth from the compressor to the tire. He uses his judgment as to how much air to put in, then disconnects the line and attaches the gage to check the presture. He may have to go through this several times until the pressure is right.

"Now you may be wondering why we go to all the trouble of connecting and disconnecting the service line and gage. Why don't we use a service-through type gage? That's exactly what we do when we have a serviceable service-through type gage. But we seldom have one. Seems that every time we send one to PEML for a calibration check, if it is out of calibration, the gage comes back with the service-through part capped off. So then it's just another pressure gage.

"If you are crewing, say, an F-100 you may not have much sympathy for us. But think about what is involved when you have to service 10 tires on one airplane such as the C-141. It's a pretty time consuming operation."

The sergeant certainly has a problem for which there is currently no firm answer. As of this writing, MAC was running a test that called for servicing C-141 tires to a set pressure of 185 ± 5 psi for all gross weights. However, enroute stations still have to check the tire pressure for each tire on each airplane. There has been a suggestion that has yet to be approved but seems to have merit. According to the suggester, it would both simplify tire servicing and make it safer. The suggestion calls for installing a shutoff valve on a service-through gage. With this kind of equipment one man could turn on the pressure, then monitor and regulate the input to the tire at the aircraft. It would also allow the mechanic to move to the front or rear of the tire, out of the danger area.

Perhaps what has been said here will give some of you hard-thinkers an idea and you'll come up with a suggestion that will make you some money as well as help the Air Force. Then we won't hear the lament, "Sarge, I can't make it in that length of time. Just servicing the tires will take too long." ★

OPS topics

TOUCH AND NO-GO

An OV-10 pilot experienced Nr 2 engine failure while in the traffic pattern. He attempted to land but touched down long. He realized his mistake and decided to go around. Unfortunately, due to the low airspeed, flight control response was insufficient to maintain aircraft directional control with the power that was necessary on the good engine. He delayed his ejection until his chances for a successful ejection were minimal. In the ensuing ejection the rear seat occupant survived but the pilot was killed because of failure of the seat to function in the low speed/low altitude mode. For some undetermined reason, the seat sensed the high speed mode which gave an excessive delay at low altitude. The other seat worked properly, deploying in the low speed mode. Had the pilot landed the aircraft at the normal touchdown point, most likely he would be alive today. Or, if he had not attempted a go around with all the odds against him, his chances of survival would have been better than risking a low altitude ejection. ★

HIDE 'N SEEK

Flying at night without lights is like playing Russian Roulette. You might luck out, then again you might not. Here's a couple of birds who did and didn't. They collided in the air but managed to land safely.

An O-2 had flown a blackout entry to the pattern at a SEA base with the tower's approval. At about 500 feet on final he turned on his navigation lights and rotating beacon and was advised that a UH-1 helicopter was making a missed approach in the opposite direction. The crew couldn't find the chopper, which was also blacked out. Over the overrrun at 300 feet the O-2 jock turned on his landing lights and spotted the chopper. Both aircraft took immediate evasive action but the right wing tip of the O-2 struck the right roof area of the helicopter. Close, but not fatal—both maintained control and landed. ★

GOOD SHOW

A recent explosives accident resulted in some outstanding actions by those involved. The right engine of an F-4 was being started for an ADC scramble mission. During the start the engine starter cartridge exploded not once but twice. A sergeant standing by the fire extinguisher ducked under the bird in an effort to put out the fire. However, the cartridge exploded a third time. The sergeant reeled back and CB from the extinguisher was deflected off the aircraft into his face causing chemical burns around the eyes, incapacitating him. An A1C immediately went under the aircraft, put out the fire and pulled the sergeant from under the bird. The primary cause: engineering-material failure in that the cartridge ruptured. It is suspected that the propellant deteriorated due to age. Fortunately the airplane was saved and the two airmen involved escaped serious injury. Quick action by these two men averted a major aircraft loss. ★



F-102 MOD

The F-102 (MB-5) simulators of the 4780th Air Defense Wing at Perrin AFB have been modified to allow the emergency gear extension system to function exactly like the aircraft. The need for this modification evolved as a result of a recent incident when the pilot was unable to pull the emergency extension handle, even though the system was operating in accordance with the Dash-One.

This mod can be accomplished in approximately five hours and requires no special parts. Units possessing F-102 simulators who would like detailed instructions on the mod may contact:

4780th ADW (DOTWS)
Perrin AFB, TX 75090.

Capt Lionel A. Boudreaux
Stan/Eval Officer
4780th ADW

JIGGLE, JIGGLE, JIGGLE

By now we have just about convinced all T-Bird jocks of the need to recheck the gear handle in the down-and-locked position before landing. Now we need to extend the process a bit further to insure the gear is up and locked after takeoff. A minor accident occurred when Gs were exerted on a T-33 for an Immelmann. The gear handle moved from the *up* position to the *down* position. As the airload caught the right main gear it carried it to an over-center position which caused a failure of the gear actuator where it attaches to the airframe. This in turn caused a tension failure of the hydraulic down line and twisted the shuttle valve loose from its mount, breaking the seal. The normal hydraulic system bled out through the broken line. When the emergency system was selected and the pump activated, the shuttle valve worked properly but the pressure escaped around the broken seal preventing adequate pressure from building to unlock the left main gear and lock the nose gear down.

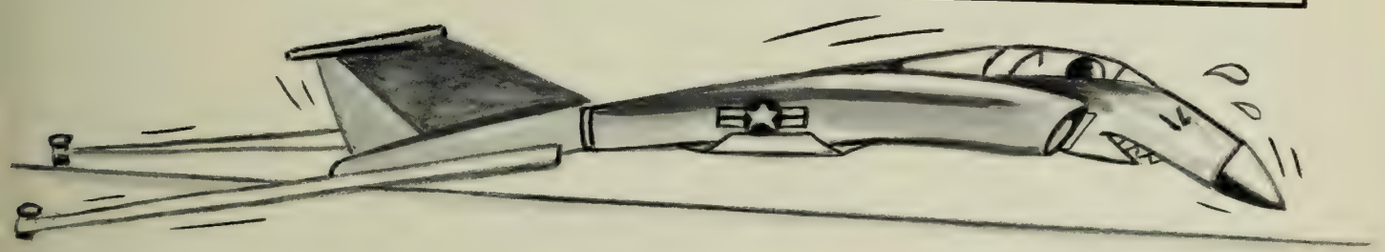
A ground check of another T-33 proved that it was possible to raise the gear handle, get an indication of up and locked but with the gear handle not *locked* up. Best jiggle check, fellows, and make sure your gear won't come *down* when you put a few Gs on the aircraft. ★

FLIP CHANGES

VIP Remarks: The pickup and drop off point for VIP passengers should be listed in the Remarks section of the DD-175, see FLIP Planning Section II, North and South America.

FLIP Terminal: As an aid in identifying current volumes, the expiration date will be printed on the backbone of all FLIP Terminal volumes. This practice began with the December issue of the U.S. Low Altitude Terminal booklets and will be subsequently extended to other FLIP Terminal products, on a world-wide basis, as production schedules permit.

VFR Products: The VFR Supplement and the Aerodrome Sketches for the United States are now being produced only every six months. Periodic updating will be accomplished through Military Aviation Notices (MANs). ★



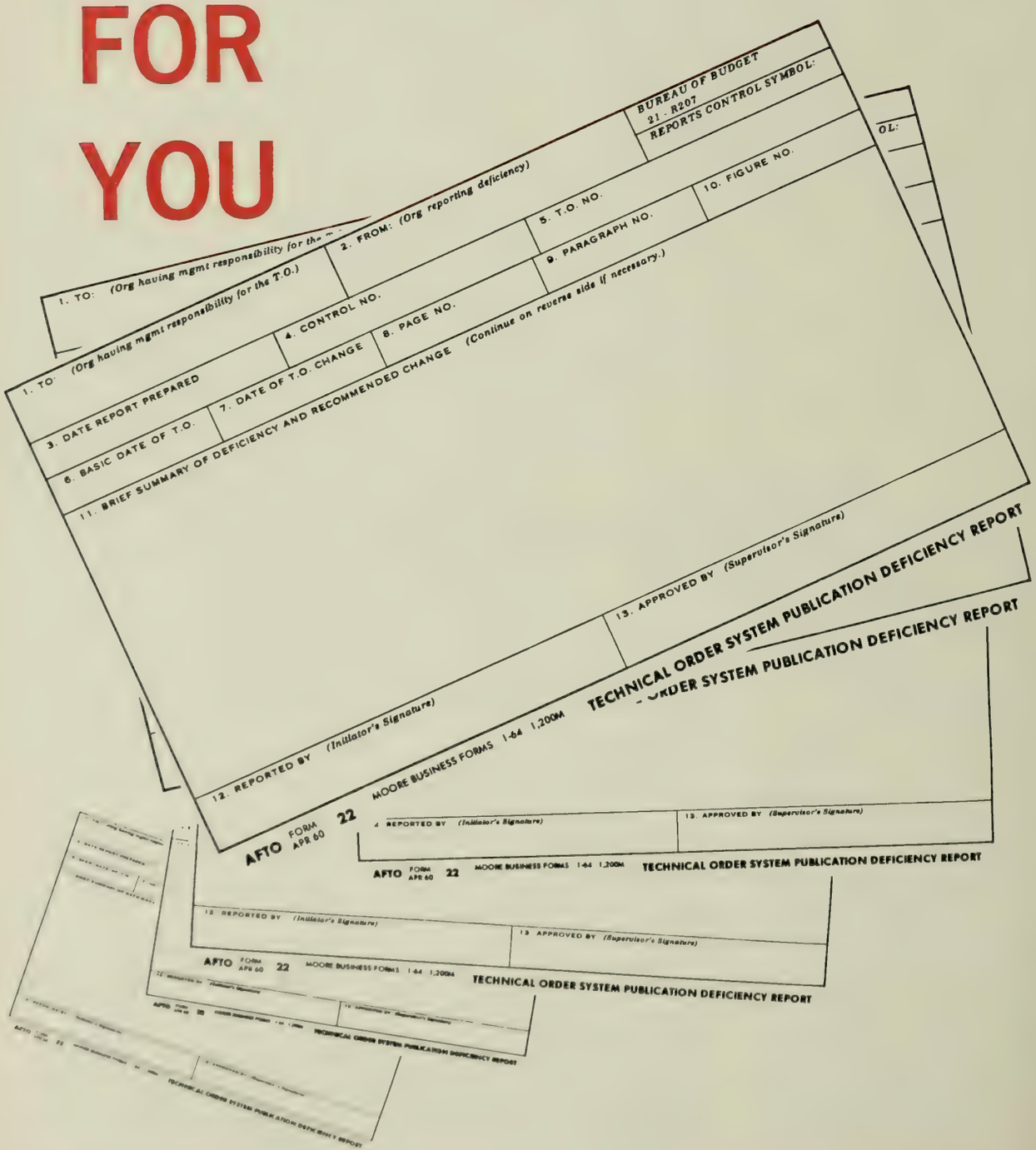
RUBBER BAND EFFECT

During straight-in GCA recovery the F-4 began uncommanded yaw and roll. As airspeed was slowed below 190 knots, gear and full flaps down, oscillations in yaw and roll increased to approximately 15 degrees. Aircraft commander initiated a go around and declared an emergency. As airspeed increased, oscillations decreased but were still noticeable in turns at 300 knots. A controllability check was flown at 200 knots, gear down, flaps up. Roll and yaw stab augmentation were disengaged; ARI, aileron trim, rudder trim and trim control circuit breakers were pulled with no effect noticed. A GCA was flown planning an AEBE, BAK-12. Airspeed on final was 200 knots. As airspeed was reduced below 200 knots over the overrun, the oscillations again increased. The aircraft commander deployed the drag chute which stabilized the aircraft just prior to touchdown.

A successful engagement was made at approximately 190 knots. All tape was pulled from the BAK-12 and a severe roll back and swerve occurred. The aircraft was turned 90 degrees to the left and was departing the runway when the tail hook dug into the soft earth. The tail hook buckled and the aircraft stopped with no additional damage. The aircraft commander attempted to stop the rollback with maximum braking but the brakes were not effective. Aircrew statements indicate that the snap back and swerve were violent.

The moral to this story is that this type of reaction can be expected anytime weight and airspeed force you into Regime IV of the Dash-One. If you don't "rubber band" back you'll probably break the tape. Be aware! ★

MAKE THE '22 WORK FOR YOU



Maj Donald M. Cassiday, Jr.
Hq 3AF, APO New York 09125

Little Elmo went to the base library and asked for a book on penguins. Given a scholarly tome on the subject, he repaired to the stacks and began to read. Ten minutes later he was back at the librarian's desk, returning the book. "My goodness, Elmo, you're a fast reader to finish that so soon," said the librarian. "Oh, I didn't finish it—it had more on penguins than I wanted to know," the lad replied.

Many maintenance folk feel about tech data the way little Elmo felt about penguins. They've been deluged with pleas to follow tech data until they just don't want to know anymore.

Such saturation should have borne fruit by now but who has seen an inspection report lately without a write-up like this: "A technician was observed performing maintenance without using tech data." Time and time again we read of these incidents until one gets the impression—wrongful, I believe—that no one ever uses tech orders.

There are some exceptionally good reasons why tech data should be used on all maintenance tasks. Murphy's law is and probably always will be valid. Old sarge may have changed 1000 F-100 wheels before, but there is no guarantee that he hasn't done it incorrectly 1000 times. Even if he did it right the first 1000, a late pay notice, junior's tonsils or that bad ice he got at the club last night might lead to his doing it wrong on the 1001st time. Suffice it to say that tech data is the best insurance we've got against Murphy's law.

In spite of this you can usually find a few old heads who will tell you several reasons why people can't be bothered with using tech data. Let's explore a few of these reasons and see how valid they are.

I don't have to go far to find a Chief who says, "It's that lousy tech data we've got. It's so fouled up that you just can't use it." I would like to suggest that AFLC's tech data authors have given you every opportunity to help them improve their product. The AFTO Form 22, Technical Order System Publication Deficiency Report, is the vehicle to be used to tell AFLC how to improve their tech data. A little thought by the experts who are on the end of the wrenches and a little care taken in preparing the AFTO Forms 22 might do wonders for the whole TO system. Just remember, if it's bad, you share some of the blame!

A similar complaint involves the unhandy format of TOs. Anyone who's tried to use a 300 page tech order on a Kansas flightline while the wind is gusting at 30 knots knows what I'm talking about. Similarly, the mechanic who has tried to take a TO into the cockpit on an F-4 while working on the bucket knows the meaning of unhandy. There are a couple of answers to this.

The AFTO Form 22 applies to format as well as content and your ideas for improving format and design are certainly welcome. Until the better designs and formats come along, though, the man doing the job still needs tech data. Perhaps a "two-man policy" might solve some of these problems. There's nothing to prevent Airman Minion from reading the book to Sergeant Clever while he's standing on his head to tighten a widget.

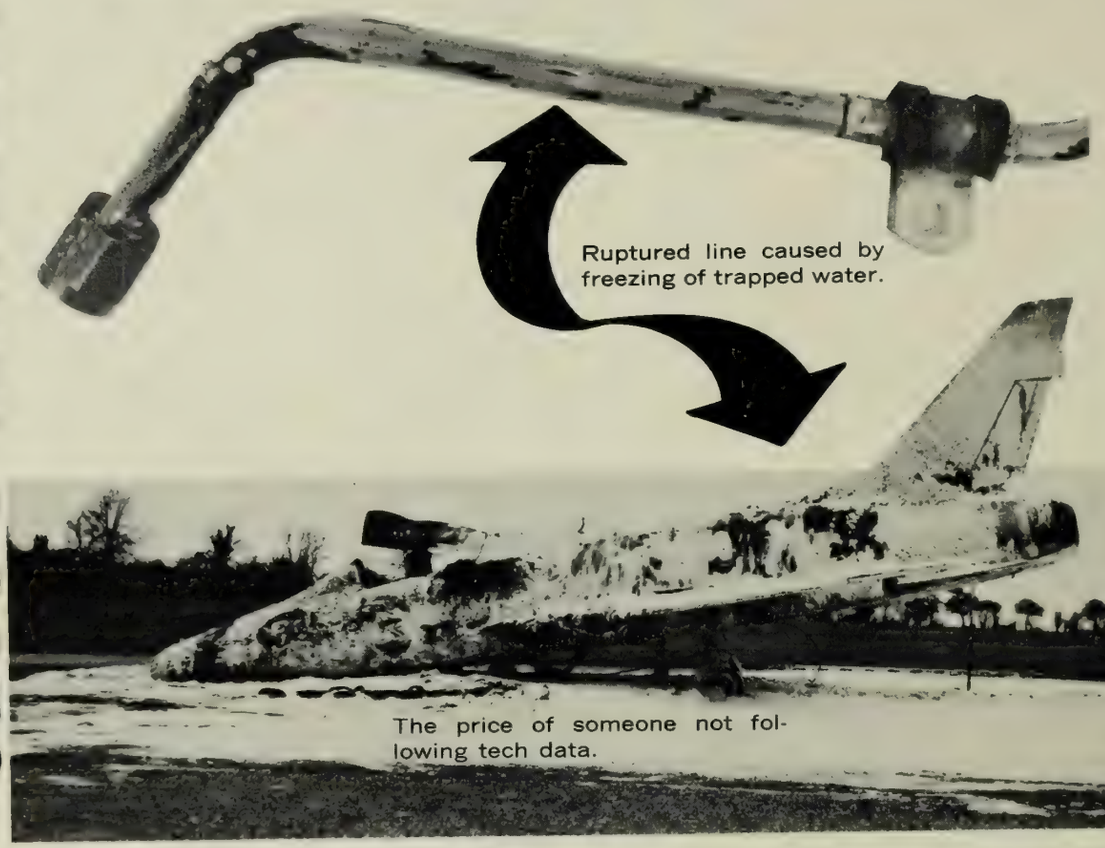
Another line of argument has to do with the simplicity of some tasks and the skill of some people. Who would deny that there are some folk around who are smart enough to do some jobs without a checklist. The problem comes in identifying who and which. The number of variables associated with the men and the jobs is so great that it is just not possible to draw a dividing line.

The simplest of jobs can become tough during cold weather or after the equipment has aged. Any individual's ability to do the job will vary with his health, emotional state and even the time of day. In light of factors which affect task performance, it is impossible to establish an absolute rule for when tech data should be used and when it isn't needed without leaving ourselves vulnerable to the effects of Murphy's law.

In the final analysis there's only one goal to shoot for and that has to be 100 per cent. We should do all we can to see that the tech data we have is the best possible and in the most effective format, but we also must be sure that we use what we have. The stakes we are playing for are too high to settle for anything less than perfection. ★

save 5 minutes... LOSE 1 AIRCRAFT...

Capt Rafael A. Goyco, Directorate of Aerospace Safety



The price of someone not following tech data.

I have just finished reviewing an accident report involving an F-100 aircraft destroyed by fire following an aborted takeoff. The airspeed indicator gave the pilot erroneous readings and he chose to abort the takeoff and engage the barrier. After engaging the BAK-9 at a high rate of speed, the nose landing gear collapsed and the pitot tube went under the MA-1A barrier cable. The cable tore the wing tanks open and the spilled fuel ignited. Fire destroyed the aircraft, but the pilot managed to get away from the accident without injuries.

The airspeed indicating system was not working properly because of a ruptured drain line located in the left side of the fuselage behind access door F33. The inspection of drain lines was signed off by the crew chief, but when questioned, he said he had not drained that specific line because he did not know its location. But he signed off the inspection! Investigation revealed that water had frozen in the line causing it to break and provide erroneous airspeed indications.

Now, I wonder—why didn't this crew chief check the applicable technical order to make sure that he was doing the right thing? There are several possible answers that I can give you. One, he may have been in a hurry to get home. Or he relied on his experience (or lack of it.) Finally, he may have asked another crew chief, who gave him incomplete information. Supervisors, beware! Make certain that your mechanics know the tech order systems and insist they use them at all times.

There is no substitute for using technical orders. They were published in the first place to aid the mechanic in solving the problems that are encountered with today's complex weapon systems. In this specific instance, the mechanic was negligent in not checking TO 1F-100D(I)-2-1, pages 3-40 and 3-41, Figure 3-21—the pitot-static system section of the airplane general technical order for organizational maintenance.

It took me about five minutes to locate the correct procedure for draining these lines. The crew chief saved those five minutes, but he lost his airplane. Read and follow the tech orders and you can prevent accidents like this. ★

Toots



is interested in your problems. She spends her time researching questions about Tech Orders and directives. Write her c/o Editor (IGDSEA), Dep IG for Insp & Safety, Norton AFB CA 92409

Dear Toots

I would appreciate further clarification on signatures required in Block F of AFTO 781J. Our interpretation is that there is a requirement for signatures in this block only when we (being at squadron level) are inspected by a group or higher echelon. Right or wrong?

SMSgt L. M. Cox
126 CAMS, Ill ANG

Dear Sergeant Cox

Block F of AFTO Form 781J is to provide a record of inspections performed by personnel from a higher echelon, such as the Wing QC Officer or higher. However, if the squadron commander desires, he can require a signature in this block by almost anybody above the crew chief, such as the line chief, maintenance officer, etc.

Toots

Dear Toots

Your old flame is writing again, this time in reference to the Operational Check. When an entry is made to say "Operational Check Due for Installation of an Indicator" and a pilot performed the operational check by runup or inflight check, which does he sign—the "corrected by" block or the "inspected by" block of the AFTO 781A? I know that when he performs an FCF he signs the "inspected by" block but nowhere does it say how to sign off an operational check. A long time ago, TO 00-20-5 specifically stated that operational checks would be signed off in the "corrected by" block, but not now. What's up, Doc?

MSgt Patrick A. Bowers
Det 12, 43 ARRS
Randolph AFB, Texas

Dear Pat

The people responsible for 00-20-5 feel that since there is nothing that specifically covers inflight operational checks, other than FCF, the local units should establish their own policy for signing off any such checks. However, I agree with you. The TO should cover it, but it seems the only way to get it into the TO is by submitting an AFTO 22. So, how about it?

Toots

Dear Toots

Please help me clarify a matter we have discussed for some time. It is in regard to aircraft engine removal. My question is this: If on a multi-engine aircraft you must remove the engine(s) for inspection of engine mounts, must you remove one engine at a time or more than one engine and FCF the aircraft after one engine or both engines?

Please answer with either reference to TO or your opinion.

MSgt John Jesse
143 Sp Ops Sq, RIANG

Dear Sergeant Jesse

In reply to your question regarding the requirement for performing a FCF after installing the engine or engines that were removed for the purpose of inspecting the engine mount:

(1) The Dash 6 inspection requirements (for whatever type of aircraft you're working on) spells out the conditions under which an aircraft will require an FCF.

(2) TO 1-1-300 leaves the decision for an FCF up to the maintenance officer. It also indicates that good sound judgment should be used to avoid scheduling unnecessary sorties on an aircraft.

So, first off, it's the maintenance officer's responsibility to make a decision. Second, if the Dash 6 of a twin-engine aircraft requires an FCF for removing and replacing the same engine, for engine mount inspection, and if both engines require the same inspection, it stands to reason that you would save time and money by completing them both, then flying only one FCF. However, as I pointed out earlier, this would be a decision for the maintenance officer.

Toots

Tech topics

briefs for maintenance techs



handle compressed air with care

Handling an air hose filled with compressed air could be like handling a loaded rifle. Both are special tools that will do the job. And both could cause serious injury if used improperly. To alert you to the dangers of compressed air, we are adapting some information from General Electric Safety Bulletin Nr 15.

Although accidents due to compressed air are uncommon, they are apt to be serious when they do occur. For example, it is the practice of many workers to dust themselves off with compressed air after the day's work. The compressed air hose is readily available and it does a good job of cleaning. Unfortunately, the hazards connected with this practice outweigh any possible advantages.

There is danger of the air entering the body through several normal openings: the nose, mouth, ears, or rectum. This could cause a rupture of the lungs, the stomach, or the intestines. This is a high price to pay for the cleaning of your clothes, especially when your clothes can be cleaned by a safer method.

When compressed air is used to clean parts held in the hand, there is danger that particles can be driven into the skin or through the air at another person.

In addition, the compressed air may contain large amounts of impurities. If this air enters the body, the foreign matter could result in infection and illness.

To avoid possible injury or illness, observe the following suggestions:

- Never point the compressed air hose at anyone.
- Do not repair air tools or change from one tool to another without shutting off the compressed air supply.
- Do not use compressed air for sweeping the floor and cleaning off the work bench or the material where you are working. If it is necessary to use compressed air to clean your work, always wear suitable eye protection and follow normal safety practices.

Using compressed air improperly is like placing a loaded rifle in the hands of a three-year-old child. The results are almost predictable. Handle compressed air as you would a loaded gun.

(General Electric Jet Service News)

checklist discipline

Probably you have seen one of those movies in which the hero removed the detonator from a bomb just seconds before the thing would have blown up and destroyed the whole city. During those tense moments there are few people who would notice whether the hero used a checklist.

We rationalize and say to ourselves that the movies can simulate anything, and that nobody would attempt such a task without a checklist in real life. Wanta bet? All too often explosives accidents and incidents can be traced to a checklist not being used, or one or more of the steps being missed. The following will illustrate what we mean.

A certified crew was dispatched to functionally check a SUU 21/A and load it with practice bombs. While performing step 20, which called for the bomb release button to be depressed, the SUU 21/A was jettisoned onto the ramp. Turned out the previous flight had been



with a travel pod attached with ejection cartridges installed. The pod had been removed and the dispenser uploaded but the aircraft was never de-armed or safety pinned as called for in the checklist.

Or, when the pilot attempted to release a MK 106 practice bomb the dispenser and all went. In this case the load crew, after uploading the bombs but prior to performing the required functional check, left the aircraft for another job. It was also discovered that the bombs' single shorting plug was still installed in the do-all receptacle of the right inboard pylon. What happened to this crew's checklist?

Then there was the sergeant who successfully installed the seat kit in the front cockpit of an F-4 then blew it when he went to work on the rear seat. He attempted to insert the ring of the seat kit deployment lanyard over the guillotine sear pin by applying pressure from the rear of the pin assembly with a screw driver. With no safety pin installed, the sear pin moved to its full extent and fired the guillotine cartridge. This man did not have a checklist in his possession.

The last one we will cite involved a crew performing an electrical check of an F-4 armament system. They did a beautiful job of letting the loaded centerline multiple ejection rack jettison onto the ramp. No checklist!

And so ad infinitum. Where's the discipline and the supervision?



closing the barn door

During an operational check of all eight B-52 engines the starting sequence was normal and engines were advanced to 1.5 EPR to check and adjust throttle alignment. The throttles were rigged and power advanced to 2.0 EPR to check throttle alignment above bleed valve closing. Power was then reduced to make final rigging adjustment and again advanced to 2.0 EPR for a final alignment check. At this time the aircraft rolled over the chocks and ran into a parked metro-van, crushing the metro into the dock door. The aircraft traveled approximately 80 feet and the nose section passed through the empennage opening in the dock door, causing damage to the radome and the lower forward fuselage skin. The immediate cause of this fiasco was that maintenance personnel deviated from tech data by not assuring adequate hydraulic pressure prior to engine start.

Dum-dum, you say. Maybe so, but prior to this incident engine run-up technicians were not required to receive training in hydraulic system operation. This unit has since started an accelerated training program for run-up people on the hydraulic system "need to know" items.

Tech topics

CONTINUED

hot ground wire

We hear frequently that smoking is bad for our health. However, here is one case where, if the man had been a smoker, he might still be alive.

A three-man maintenance team decided to take a smoke and coffee break prior to performing a pitot static check on an AGM-28. One of the team members, a non-smoker, left the break area approximately 10 minutes ahead of the other two. When the remaining two airmen returned to the work area they found the non-smoker lying across the cable tray, unconscious.

While removing the stricken member from the cable tray, they discovered he was clutching in his hand an alligator grounding clamp from the S2-14M-A. It was also discovered that power was on the S2-14M-A, and that the alligator grounding clamp was hot. All efforts to revive the airman failed.

Power was supplied by the power unit through a receded pin in a connector. Readings of 250 volts and 5 amps were found at the ground wire.

The lesson we are trying to point out is not that we think you should be a smoker, but rather, (1) unless it is absolutely necessary never connect or disconnect a wire (even ground wires) with power on the equipment, (2) if you must work on equipment with power on, *use the buddy system.* If you are in doubt about the buddy system, see AFR 127-101, paragraph 10-6.



panel problems

Just prior to flight the F-106 technicians were trouble-shooting a nucleonic oil quantity malfunction. One technician found a broken fastener on one of the inspection panels. After securing the panel with four good fasteners, he wrote up the broken fastener in the 781 forms, identifying it as panel Nr 198. He then notified the sheet metal shop directly. A sheet metal man was promptly dispatched, but was unable to find anything wrong with the fasteners on panel Nr 198. He did find a broken fastener on another inspection panel, replaced it, and signed off the discrepancy in the forms.

You may be wondering, so what? What's the problem? Well, the next postflight revealed a panel missing. You're right; it was the same panel the trouble-shooting technician had found with a broken fastener; however, it was not panel Nr 198.

riven rivets

The following C-7 incident indicates the pilot must have had his hands full and, also, a job well done in getting the bird back on the ground.

During a crosswind takeoff the pilot noted extreme stiffness in the aileron controls, accompanied by moderate airframe vibrations. At 1000 feet the flight mechanic observed the right outboard aileron cocked up approximately six inches. At this time the pilot performed a controllability check and found that with full left aileron, he could safely control the aircraft. Due to the crosswind and the lack of crash equipment at the local base, he decided to recover at an alternate. No difficulties were encountered enroute. However, due to previous difficulties at slow airspeeds, touchdown was made at 110 knots with no flaps. Severe vibrations were encountered during initial deceleration; however, they subsided at approximately 40 knots. As the aircraft cleared the runway the flight mechanic reported the right outboard tire blown.

The immediate cause of the control problem was that the right aileron hinge arm had sheared and approximately five feet of rivets had been popped in the upper shroud area along the right outboard flap. A detailed investigation of the hinge channel indicated that the lower attachment rivets had sheared and the center channel had pulled loose. The culprits were those who installed cherry rivets in lieu of solid rivets at an undetermined time and place. ★

PORTABLE DOCKS





It gets hot in Thailand—and wet, conditions that are a way of life for maintenance men assigned to Southeast Asia. At Ubon RTAFB, Thailand, somebody decided to do something about it, so the welding and fabric shops of the 8th FMS got busy and turned out some neat portable shelters.

The shelters are made of metal pipe frames covered with aluminized canvas which is waterproof and reflects heat. Wheels make the shelters easily movable from one aircraft to another. ★

Photos by A1C Roger Crescentini, 600 Photo Sq, AAVS

PROJECT CLEANSWEEP





Sgt Richard Davis, 307 FMS, operates high powered stream of water to flake paint off a B-52 engine cowling.



Part of the Project Cleansweep operation is the repainting of the aircraft. Sgt Lawrence J. Smith, 307 FMS, sprays a B-52 with camouflage paint.

TSgt Ray A. Gant, a 307th Headquarters Squadron Section Quality Control & Evaluation inspector, administers a "follow-up" inspection on corrosion control maintenance performed on one of the Cleansweep B-52s.

Busy aircraft flying frequent missions tend to accumulate numerous minor discrepancies. To prevent these from becoming a major problem, the 307th Strategic Wing at U-Tapao Airfield, Thailand, clears the squawks on its B-52s one aircraft at a time under a program called *Operation Cleansweep.*

Selected aircraft receive a concentrated maintenance attack over a five-day period. Not only are all discrepancies cleared, the aircraft are painted inside and out, new decals are installed and even new light bulbs. Sixteen men from the 307th Maintenance Squadrons are assigned to the program, 12 working the day shift and 4 at night. ★

Photos by SSgt D. P. Jenkins



TWO-MAN VIOLATIONS

What happens when a lone individual crosses the boundary of a no-lone zone and approaches a nuclear weapon loaded aircraft? Usually he will hear a loud whistle and quickly become the center of attention of several persons. Right? Usually! Recently several violations occurred that were not immediately detected. The violation was discovered only after an inventory or upon noticing something misplaced (such as a roll of toilet paper on top of a B-52 wing). A few violations that had the desired result have been caused by someone absent-mindedly stepping across the line, others by a change in working habits (two men leaving a third, not normally a part of the team, in the cockpit), or a boredom which led to unauthorized activity (controller left the Command Post to visit with a passerby.)

Through October 1970 there were 14 two-man violations. Three of these required re-evaluation of the violators' qualifications under the Human Reliability Program. The others have been mostly a result of "contempt bred by familiarity" caused by hearing the "same old briefing" so many times that it has become "old hat." How about giving the two-man policy a little extra attention—vary the briefings to make them as interesting as possible and motivate the team to adhere to the no-lone zone policy and keep violations to a minimum.

NUCLEAR SAFETY AID STATION



5TH WHEEL

A team was dispatched for a Guidance and Control unit change. The operation progressed normally until the team began backing out of the site and preparing the semitrailer for departure. Two topside personnel lowered the front of the semitrailer and removed the rear jacks. The trailer brakes were set and the tractor was backed under the semitrailer. At this point no one was assisting the driver and he could not confirm that the semitrailer was raised by the 5th wheel. He noted that the 5th wheel lock pin moved forward and he successfully completed the two pullaway tests. No one bothered to make a visual check of the 5th wheel locking jaws. After the front jacks were raised and equipment stowed, the semitrailer was pulled from the launcher—and then it happened! During the first turn and after traveling approximately 60 feet, the semitrailer fell free from the tractor. Rotten luck usually accompanies personnel error.



PUSHED AROUND

To facilitate positioning a reentry vehicle (RV) in an RV transport van, maintenance personnel moved the pusher unit from its normal storage position and temporarily tied it down. (The pusher unit is used to open the missile silo closure.) After positioning the RV, the maintenance team neglected to return the pusher to its proper location and to tie it down in accordance with technical order requirements. In transit, the dolly mounted pusher broke loose and rolled to the front of the van where it struck and damaged the RV spacer unit. That ole gremlin called "NEGLIGENCE" works hard to degrade safety and professionalism. Don't permit him to push you around.

ERRATA

The article "Air Force Nuclear Weapon System Safety," November 1970, contained three charts which were mislabeled. The charts are reproduced below with corrections shown in color.

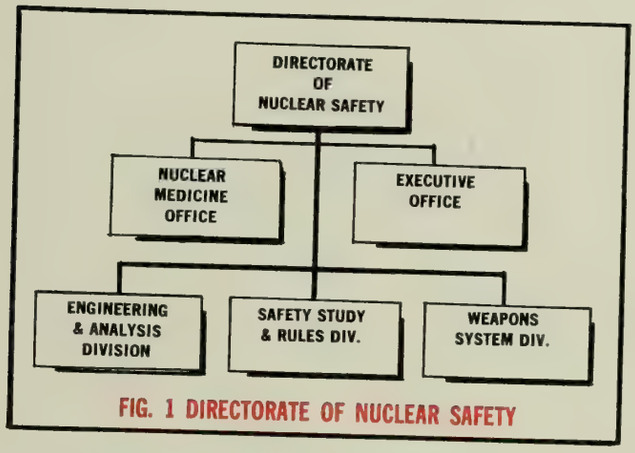


FIG. 1 DIRECTORATE OF NUCLEAR SAFETY

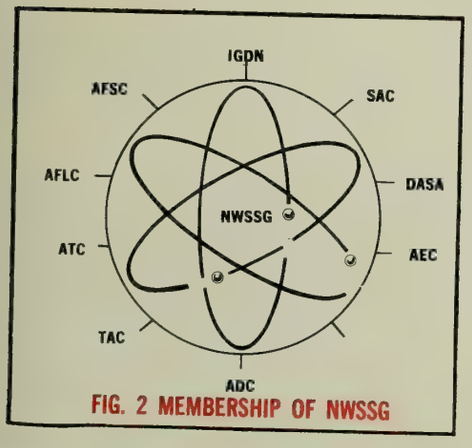


FIG. 2 MEMBERSHIP OF NWSSG

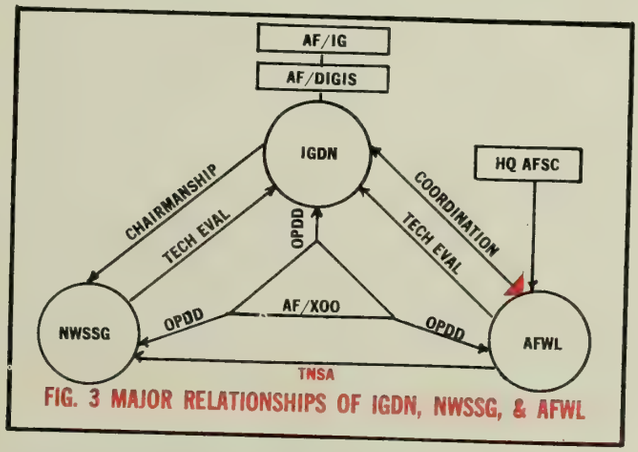


FIG. 3 MAJOR RELATIONSHIPS OF IGDN, NWSSG, & AFWL



HELLO? HELLO?

Sure do enjoy reading your fine magazine. Saw something in the August issue that might explain what might be the trouble with your headset (if any).

IT'S ON BACKWARDS . . .

LCDR C. Wawrzynski
CGAS, San Francisco

With our model, who cares?

A-1E INDIGESTION

At one of our bases in SEA, an electronics specialist was dispatched to remove and replace a defective component in an A-1E. While removing the old component, the specialist found a pocket knife in the fuselage bay containing the electronic equipment and flight control cables and pulleys. A further search revealed the following items:

1 metal spring
3 metal parts
5 bolts
3 nuts
5 pieces of plastic
14 metal washers
50 pieces of safety wire
5 rocks

The items were turned in to the maintaining unit's Ground Safety officer who showed them to the Wing Safety officer and the A-1 unit commander.

Only pure negligence can account for so many foreign objects being found in the face of the constant emphasis on the possibility of jammed flight controls or shorted electrical circuits.

Shortly before this incident, the A-1 unit had an aircraft impact into a mountainside for no apparent reason. If you were a pilot, how would you feel about flying with this kind of maintenance being performed?

In case this sounds exaggerated, I was the specialist who found the items mentioned and who arranged them for the picture before they were taken to the Wing Safety officer.

Sgt Howell H. Hughes, Jr
4429 CCTS
Cannon AFB, NM

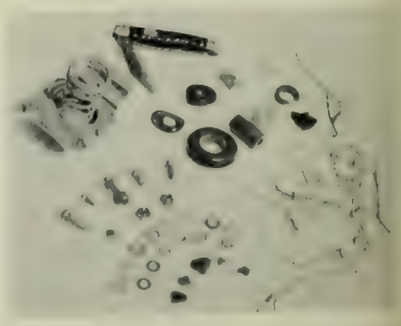
SEPTEMBER ASM COVER PHOTO

Undoubtedly many of your readers had questions about the beautiful color cover on your September 1970 issue. Just for the record and to answer some of these questions, here is the background.

The photo was taken between Osan, Korea, and Guam in November 1969. The F-106s were part of the 94th Fighter Interceptor Squadron, then at Selfridge and now at Wurtsmith AFB, Michigan. The unit was returning from a six-months deployment to Korea as part of the Aerospace Defense Command air defense for free world forces in Korea. ADC first demonstrated global capability after the Pueblo was seized. While ADC no longer has the Korean commitment, it still has the ability to deploy anywhere in the world to provide air defense.

Mr. Kenneth Hackman took the photo with a 35mm lens on a motorized Nikon. Film was Kodachrome II, shot at f5.6 at 250.

Lt Col Arthur F. McConnell, Jr
Director of Information, ADC



☆ U.S. GOVERNMENT PRINTING OFFICE 1971 431-460/5

UNITED STATES AIR FORCE

WELL DONE AWARD

Presented for outstanding airmanship and professional performance during a hazardous situation and for a significant contribution to the United States Air Force Accident Prevention Program.

Major James E. Oliver



1st Helicopter Squadron, Andrews AFB, Wash. DC

On 17 September 1970, Major Oliver was flying an dministrative support mission when he experienced a ower failure on takeoff in a single engine CH-21B elicopter. Major Oliver had boarded a General Officer t Washington National Airport and was following ower instructions for takeoff and climb when, at approximately 200 feet above the ground, the engine ailed.

The aircraft, at the time, was above one of the most ongested areas in metropolitan Washington, D.C. Within a few seconds Major Oliver executed the necessary emergency procedures, alerted his crew chief and passenger, and autorotated the helicopter into the only suitable landing area in their gliding distance.

Major Oliver skillfully avoided numerous buildings, city streets, electrical poles and wires, and other obstructions as he executed a minimum roll, no power landing. All this was accomplished without injury or damage of any kind. WELL DONE! ★



TO THE MEN AND WOMEN RESPONSIBLE FOR
THE LOWEST ACCIDENT RATE IN THE
HISTORY OF THE UNITED STATES AIR FORCE

3.0%

29.1303
FLYS

AEROSPACE SAFETY

UNITED STATES AIR FORCE • FEBRUARY 1971

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FEBRUARY 1971



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UNITED STATES AIR FORCE

Aerospace SAFETY

FOR AIRCREWS, MAINTENANCE & SUPPORT TECHNICIANS

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DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

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FEBRUARY 1971 AFRP 127-2 VOLUME 27 NUMBER 2



Dear Fellow Pilots

About thirty years and a thousand combat missions ago I climbed into my first cockpit. Despite many memorable events in the intervening years, 1970 was one of the most rewarding—the U. S. Air Force experienced its lowest accident rate in history. As Director of Aerospace Safety, this gives me a great deal of personal satisfaction.

True, we can pat ourselves on the back, but there is one area where we need to redouble our efforts. Although the rate is good, pilot factor accidents still account for a lion's share of the accident statistics. Since I've been watching pilots fly airplanes for a long time, I feel qualified to kick this subject around a bit.

Looking back over the years, I wonder why or how I was fortunate enough not to get tagged with a pilot error—I've certainly had the opportunity. Sure, I've scraped a bird or two, but not through any fault of my own. To analyze how I managed to avoid this is difficult, but perhaps I can give you a bit of my philosophy on the subject.

I think that, without exception, every outstanding pilot I have known exhibits one clearly identifiable trait. Some call it conceit or confidence in his ability. I call it a success syndrome. He is confident he can successfully cope with any mission or emergency. He doesn't give up when things turn sour; there's always one more ace up his sleeve. Part of this success syndrome is positive thinking; the other, a product of his knowledge—knowledge of his machine and of his abilities. He knows his emergency procedures and he knows aerodynamics. In short, he's a professional. We talk a lot about professionalism these days. The term means different things to different pilots. To me it's knowing everything you can about the art of flying. Anything less is an invitation to disaster.

Good pilots acquire a sort of sixth sense, something that warns them when they are about to paint themselves into a corner. But there is nothing mysterious about this sixth sense. You acquire it through knowledge, training, experience and positive attitude, which, summed up, equates to professionalism.

One of the most difficult things to understand is a pilot who closes his eyes to danger. The many accident briefs I've read make it painfully obvious that the ingredients that caused the accident were present before takeoff. In retracing the sequence of events we find that the pilot may have launched on a mission that was impossible to complete with the amount of fuel aboard, or he planned a mission into severe weather without any real operational necessity.

Pilot errors in spite of all our efforts are still the major cause factor in our losses. Our jocks still kill themselves and break airplanes needlessly. The only advice I can offer after all these years is, know your machine and its capabilities *and* know your abilities—exceed neither.

With reluctance I hang up my hard hat, goggles and scarf and wish each of you a career as rich and rewarding as I have experienced.

B. H. KING, Brigadier General, USAF
Director of Aerospace Safety



TIME TO GO



Only you can make the decision. Only you can design mechanisms within yourself to trigger an automatic sequence that will propel your body from the warm, comfortable atmosphere of your cockpit. How and when you elect to activate this sequence will remain a function of what has transpired until that time when something inside you says—EJECT! Whether the ejection occurs at twenty thousand in controlled flight or at 100 feet, outside of the envelope, the decision will have been made, not necessarily then but sometime in

the past—perhaps without your knowledge.

We have to face certain things if we are to fly today's high performance aircraft, or any aircraft for that matter. One of those unpleasant facts is that, no matter how good we are with the stick and rudder, there may come a time when we are no longer master of our aircraft and are simply a passenger. When this occurs, whether we ride it in or elect to eject makes no difference to the fate of the bird. If it's doomed so are you, if you elect to remain a passenger.

The decision to eject has never been a very popular one, especially for the guy who has to reach down, pull the handle and admit that he has washed his hands of the whole unpleasant matter. When a pilot does this he has said to himself "I can't hack it anymore; it's too much for me." For any self-respecting pilot it's a difficult pill to swallow. What really bothers us is the fact that we might, just might, be wrong. Perhaps there is something else that could have been done to save the airplane. But one thing for sure, if his decision to stay with the bird is wrong, he's dead wrong.

There's an old axiom that says "Buddy, when it comes time to step over the side, you'll know it." This is true. The catch is to recognize THE TIME early enough to make the decision. Two jocks faced this problem when their T-33 flamed out at twenty thousand. Both agreed to jump at eight thousand if they were still in the weather. No change at eight; they were still in the weather, with no airstart, but decided to hold on down to six thousand and so on down to two thousand where, still in weather, with a dead engine the rear seat pilot ejected. The pilot in the front tried to go but the system refused to cooperate. He rode it in to his death. Had they stuck to the original decision *both* pilots might be alive. The pilot in front would have had time to at least give it a try over the side—it's been done before.

The troops who beat the bushes for better and more efficient ejection systems scratch their heads when the statistics show no improvement in survival rates, although our systems are better than ever. A possible answer is the, *"since the system is better, I can stay with it longer"* syndrome. It seems like a wise move for every pilot to take a critical look at the ejection envelope for his particular aircraft. Does it take into consideration bank angles, yaw or roll rates? How about dive angles? Make certain you know all the capabilities of the system.

Aside from the ostrich pilot who refuses to admit that the decision will ever confront him is the jock who, while in the companionship of his hangar flying buddies, makes such off-the-cuff predecisions as, *"I don't know of any airplane that's worth killing myself for,"* or *"I'm sticking by the Dash One, when 15,000 shows and I'm still out of control, I'm leaving,"* or maybe *"If things don't look real good at high key, adios."* Have you heard these gems? Maybe you've said them yourself. I had a friend who made those remarks, but, while dead-sticking an '86, wrapped it up in a ball of flame short of the runway after he admitted over the radio at low key that things didn't look right to him. Why did he stay with it? He sensed the aircraft was doomed. Everyone on the ground recognized his peril and advised him to get out—yet he's dead.

We have the statement of one pilot who delayed but made it. *"Because of an innate fear of meeting accident investigation boards and FEBs I decided to make one effort to recover."* Was he subconsciously aware that the airplane was going to crash in spite of what he could do, yet had to give it one more chance? Fortunately he ejected in time. The harness he shed after getting on the ground was found between the two halves of the seat. He knew it was a desperate situation before he tried "once more." He knew the odds were against him.

TIME TO GO

CONTINUED

TABLE 1
ALL EJECTIONS 1963-OCT 1970

SPEED AT EJECTION KIAS

ALTITUDE ABOVE GROUND LEVEL	0	1-49	50-99	100-149	150-199	200-249	250-299	300-349	350-399	400-449	450-499	500-549	550-599	N/A	UNKNOWN
UNKNOWN				1				1	1		1	1			25
40,000-49,999				1											2
35,000-39,999						2	1					1			1
30,000-34,999					1	1					1				1
25,000-29,999					2	4	10	1	1		2				2
20,000-24,999				1	1	5	2	8	3		2				4
15,000-19,999			1	3	2	8	7	8	4	3	1	2			5
10,000-14,999	1	3		8	12	29	11	3	6	2	1	2			7
5,000- 9,999	8	4	9	14	36	57	29	28	8	8	4	1	1		16
4,000- 4,999	1			2	16	26	9	9	2	1	2		2		10
3,000- 3,999		1	3	3	15	24	13	10	2	1	3				6
2,000- 2,999				19	27	25	19	18	8	3			1		13
1,000- 1,999	1		1	22	39	53	21	13	4	4		7			18
BELOW 1000 FT NOT SPECIFIED				1			3								5
500-999		2		13	20	20	7	6		3		3			5
250-499			2	12	17	18	2	1	1	1	2				5
100-249	1		3	11	10	15	5	2		1					8
1-99		1	5	10	18	4		2		1					9
GROUND EJECTION WCS		1	1	2	1	1									
GROUND EJECTION NWCS	5	1	3		2	2								1	4
TOTAL	17	13	28	123	219	294	139	110	40	28	19	17	4	1	146

WCS within capability of system
NWCS not within capability of system

Revised 23 Oct

Do you know of an accident board that chastised a pilot for leaving an airplane "when the odds were against him?" You may, but I don't. Pilots have ejected prematurely, at least that's the decision made by judges who sort through the facts after an accident. Quite possibly, those pilots who sit in judgement could have saved the machine, but then, on the other hand, could it be that the pilot who ejected early would have been doomed, along with his aircraft if he had attempted to salvage a desperate situation? The task may have been beyond his capabilities and so, in reality, the ejection was not premature from the point of view of this pilot's flying ability. When you lose your cool, chances are you are staring disaster in the face. The TIME for one pilot may not be the TIME for another in terms of proficiency.

Perhaps you've heard the story about one of our more illustrious pilots who, when faced with a flameout at 30,000 and no restart, calmly requested a GCA because the weather was barely above minimums. At the completion of his dead-stick GCA the only comment was that the final controller's corrections were too large. I, personally, feel that such skill (or luck) is beyond most of us and I would have ejected. Only you can make such a decision.

Fortunately the picture is not at all bleak. There is a low premium insurance policy available to all of us: *Know your equipment and know your limitations.* One has a definite effect on the other. The more familiar you become with your machine the more confidence you gain in your ability to cope with a sticky problem. If you have the feeling that the situation is out of hand you



TABLE 2
EJECTION FATALITIES 1963-OCT 1970

ALTITUDE ABOVE GROUND LEVEL	SPEED AT EJECTION KIAS															
	0	1-49	50-99	100-149	150-199	200-249	250-299	300-349	350-399	400-449	450-499	500-549	550-599	N/A	UNKNOWN	TOTAL
UNKNOWN					1						1	1			20	23
40,000-49,999															1	1
25,000-29,999							1								1	2
20,000-24,999							2	2	1							5
15,000-19,999						1	1									2
10,000-14,999						2									1	3
5,000- 9,999				1	1			1	3		1		1		3	11
4,000- 4,999						2		1				1				4
3,000- 3,999							1									1
2,000- 2,999				1		2		1	1	1						6
1,000- 1,999					2	1	2		1			5			3	14
BELOW 1000 FT NOT SPECIFIED				1			1								3	5
500-999				2	1	1	1	2		1		1			1	10
250-499				2	6	4		1	1	1	2				3	20
100-249	1		2	7	3	8	3	1		1					7	33
1-99		1	4	6	15	5		1		1	1				9	43
GROUND EJECTION WCS				1												1
GROUND EJECTION NWCS	5	1	3			2								1	3	15
TOTAL	6	2	9	21	29	28	12	10	7	5	5	7	2	1	55	199

Revised 23 Oct 1970

can bet your last dollar (you might as well), it is. Don't let pride take you down the drain. Believe it or not, some situations ARE beyond anyone's control. The ones that really give us trouble are the border line cases. If the engine blows and the aircraft is engulfed in flame there is no doubt about what to do. But if it flames out at altitude with a fair chance of gliding to a runway we very possibly will give it a go. This is the kind of emergency that demands we know our bird. How far will it glide? Is the weather good enough to attempt a flameout landing? Is the runway long enough? And, most important, if things don't look good have we established an altitude for leaving the machine? In many instances, ejections that occur outside the capability of the system didn't have to happen. The pilot put himself there by delaying his decision to eject.

We're going to lose some pilots in 1971. The cause will be stated simply: "the pilot delayed his decision to eject until successful operation of the ejection sequence was impossible." This implies several conclusions, most important of which is that it was possible for the pilot to have ejected within the safe envelope.

The intent of this article is not to encourage you to fly with one hand on the ejection handle. Far from it. We must do everything possible to get our sick bird back on the ground in one piece. However, we have had enough sacrificial attempts to save an obviously hopeless situation, with the result that both pilot and aircraft were lost. An aircraft is replaceable—you are not—not to the Air Force, not to your wife, not to your children or to your parents. Don't let your final thought be "I've stayed with the aircraft too long" and become a 1971 statistic. ★

that master mixer,

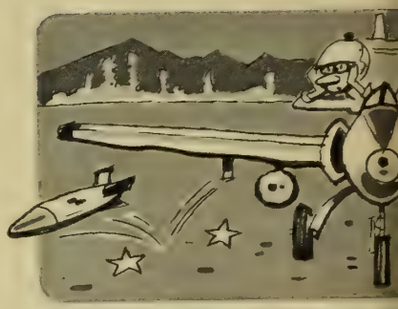
Murphy II

Just about everybody by now has heard of that peripatetic Irishman —Murphy. He hangs around the maintenance complex and fouls things up right and left, if the troops don't watch out. What you may not realize is that there is another Murphy. He's a second cousin to the one we all know and he has his own specialty. For sake of identification, let's call him Murphy Two.

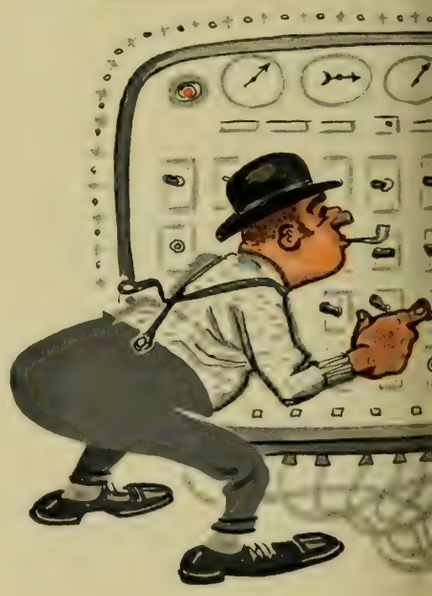
The original Murphy (Murphy One) got into the business way back when. It's even rumored that he helped the Wright brothers bust up one of their early birds. Seems he sneaked into the bike shop and reversed the flight controls. As time went by he found more opportunities, and as he gained experience he really got a reputation.

Meanwhile, Murphy Two joined the act, but he specialized on the cockpit. He figured that pilots probably would have so many other things to think about that they wouldn't complain, and that, besides, his work would provide them with a ready-made *out* when they goofed. Good thinking, Murph.

There wasn't much work for Murphy Two for a number of years, but when we started adding such goodies as retractable landing gears, external tanks, wing racks for external stores, drag chutes and tail hooks, Murphy Two was there to meet the challenge.



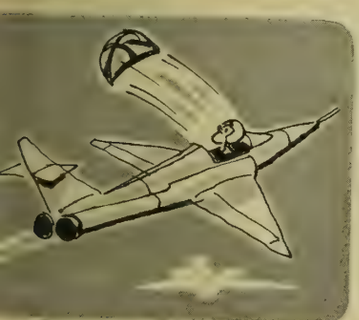




As Murphy sees his job, it's something like that of his cousin—he tries to beat the designers at their game. And he excels. For ex-







ample, he talks a designer into placing two identical switches, operating different systems, side by side. Murph thinks it's real funny when a pilot gets the wrong switch—like when the backseater in a two-seat fighter attempted to turn on the identification light switch and instead got the canopy jettison switch. It was a cold ride home but Murph didn't care.

He's also very good with handles. He started out by mixing up the gear and flap handles. That was good for years. But the real fun came when airplanes came out with drag chutes and tail hooks. This provided almost infinite possibilities. For example, he has seen to it that pilots have got hold of the gear handle instead of the drag chute handle during the landing roll. This is a bit disconcerting to the pilot, but not any more so than when he goes the other way and gets the drag chute handle on final instead of the gear. Some canopies have emergency jettison handles and pilots occasionally mistake one of these for the gear handle. When this happens there's no doubt in the pilot's mind that he goofed, but that doesn't protect property or persons below.

So many tanks and other external stores have been inadvertently jettisoned that we won't even bother to count them all. They've been punched off on the ramp and in the air. For a bit of a refinement, pilots have mixed up their switchology and, on a rocket pass, dropped bombs. This comes as quite a surprise but probably not as much so as when rockets go instead of bombs. Both events are on record —many times. Ol' Murph Two just grins and tells the bartender to set up another round.

Now, as we said before, Murphy Two really knows the aircraft systems, probably better than most pilots. It's this knowledge that enables him to fool them into doing the wrong thing. Although it couldn't be definitely proven in one case, it is very possible that Murph was responsible for wiping out a couple of fighters just this past year. Somehow or other he got the pilots to use the wrong switch and cut off their fuel during a critical moment. The fact that these tricks sometimes cost pilots their lives doesn't bother Murphy a bit.

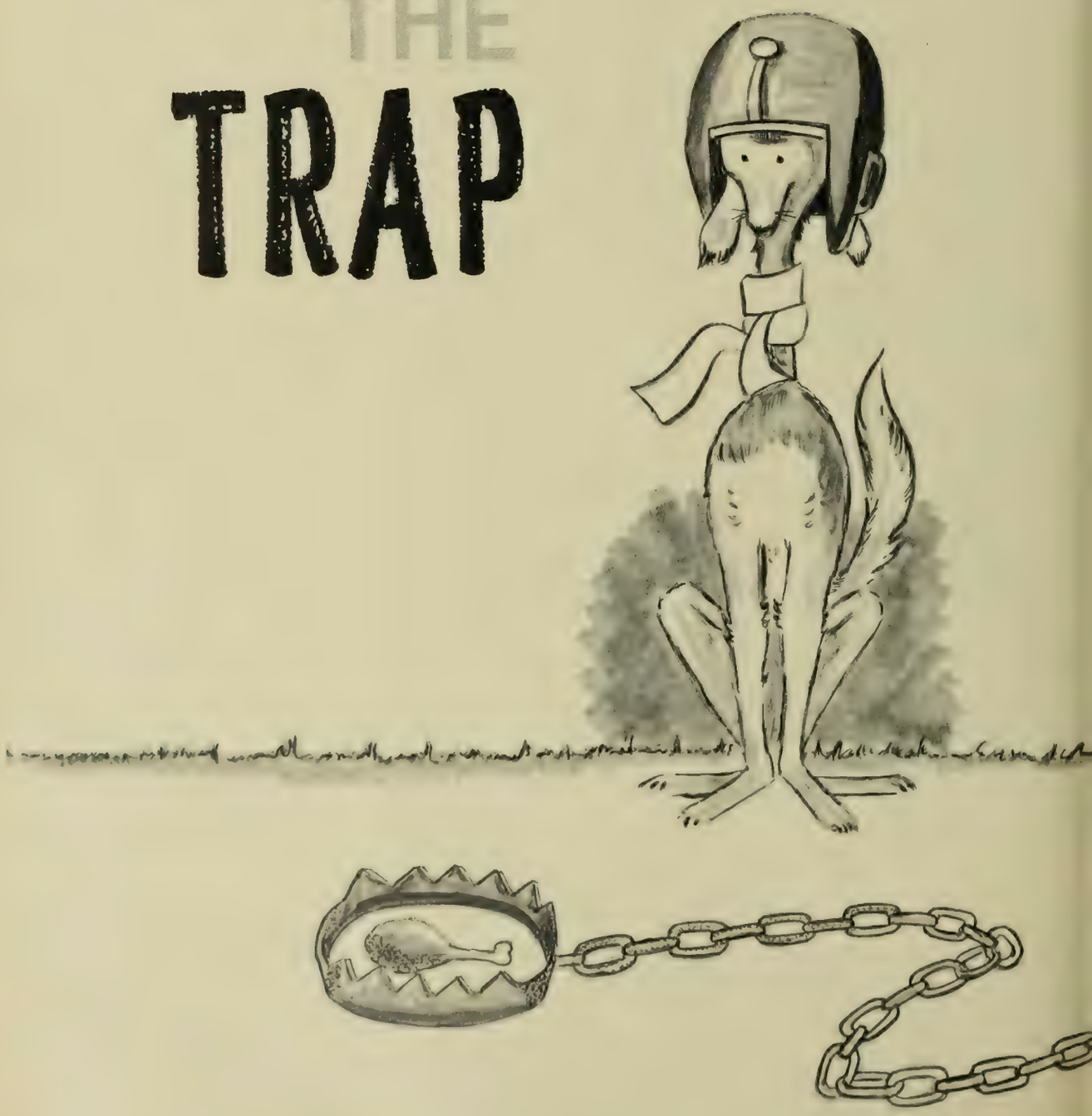
Of course, Murphy Two, like his cousin, doesn't always work alone. He is not a bit selfish about sharing the glory. He exhibited this trait when he cooperated with some others in getting a pilot to eject from a fighter. In this case the throttle stuck at 95 per cent. The pilot flew around awhile burning off fuel, then attempted a landing. He was pretty hot on touchdown, what with the engine running that fast, and he tried to shut down by turning off the fuel master switch. No luck. So the jock thought fast and made a go around. But he didn't have enough fuel left and the bird flamed out. The pilot ejected. The pilot also bought the accident, but we can't help but think that Murphy Two had a hand in it, because the system had been modified to require activation of the fuel shutoff switch for shutdown and no action had been taken to assure that all the pilots knew about the TO.

And so it goes. Murphy Two was last seen doing business at the same old stand and prospering mightily. Asked what his biggest problems were, he replied, "Two. Designers who make it virtually impossible for the pilot to actuate the wrong switch or handle, and pilots who are intimately familiar with all the switches, knobs and handles in the cockpit and who make sure they get the right one.

"There are quite a few of those around, but there are enough of the others to keep me in business for a long time," Murphy says. ★

DON'T SPRING THE TRAP

One thing about smart pilots—read smart people of all occupations—is that they are willing to learn from others. And that brings us to one of the purposes of this magazine: to spread the word so that some of us can avoid the pitfalls that trapped others. All of



which is by way of setting the stage for the following.

A couple of jocks the other day fell victim to one of those days that Jimmy Durante used to describe as the kind when he should have "stood" in bed. They filed for 2 plus 20 enroute with 2 plus 45 fuel on board. After takeoff in their T-Bird they were held to 5000 feet for 15 NM then cleared to FL 250. Above that winds were significantly stronger, which necessitated the 25,000 flight level.

First indication of trouble occurred when the fuselage low level light came on with the fuel counter reading 260 gallons. They did a little figuring and came up with 200 gallons remaining—60 gallons less. After some more computing they figured they could make Base X, using an enroute descent, with 80 gallons remaining.

At 50 miles from Base X the fuselage low level light came on again and they declared an emergency with the center, requesting a straight-in. Then the vise began to tighten. Base X would be closed for at least 15 minutes with a bird in the barrier. There was an out—the nearby international airport. But they were vectored to an extended final to permit another aircraft on minimum fuel to land. When they finally got on the ground the bird flamed out as they approached the chocks.

Maintenance found that a boost pump had failed, trapping about 65 gallons in the right wing main tank.

This crew certainly had the deck stacked against them—the boost pump failure, aircraft in the barrier and delay behind another aircraft with minimum fuel. However, back when they first suspected something was wrong, they could easily have made it into either a large civil airport or an Air Force base.

Perhaps another thought here. The runway at Base X was closed with an aircraft in the barrier, but the runway is over 13,000 feet long. It would seem that in an emergency the T-Bird could have been landed the other way or over the bird on the runway.

Just a few days prior to the event described above, another crew lucked out when they were involved in what nearly became a tragedy of errors.

The right fuel quantity gage on their T-29 had been inoperative for nearly three months so fueling the bird required a certain amount of guesswork. At an away-from-home base they took on 6600 pounds, assuming, because there was 4500 pounds in the left tank, that there was an equal amount in the right tank. They departed next morning at 0900, flew for an hour and one-half and landed at another base. After shutting down for 20 minutes they took off again and headed for a base near home.

About five hours later, as they were descending through 7000 feet, there was a pull to the right, with low fuel pressure reading and surging rpm on the right engine that continued to drop. They shut down the right engine, thinking possibly that side was out of gas, but not being sure because the gage couldn't tell them. The decision was to try to restart the right engine with fuel from the left tank. Crossfeed was selected and the right engine restarted at 2500 feet, but as power was advanced the rpm began to surge so it was shut down again.

The pilot now asked for radar vectors to a military base and was given a turn. While in the turn the left engine began to backfire. With the situation getting stickier every moment, the pilot spotted a lighted runway beneath the aircraft and made an emergency landing.

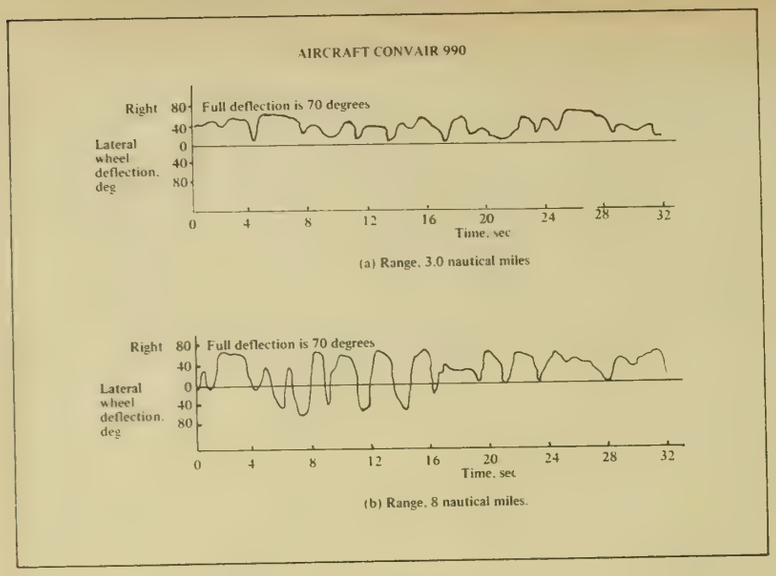
Although it could not be definitely proven, it was suspected that carburetor ice caused the left, and possibly both, engines to run rough. The flight engineer had shut off the carburetor heat at 10 to 12°C carburetor air temperature prior to descent.

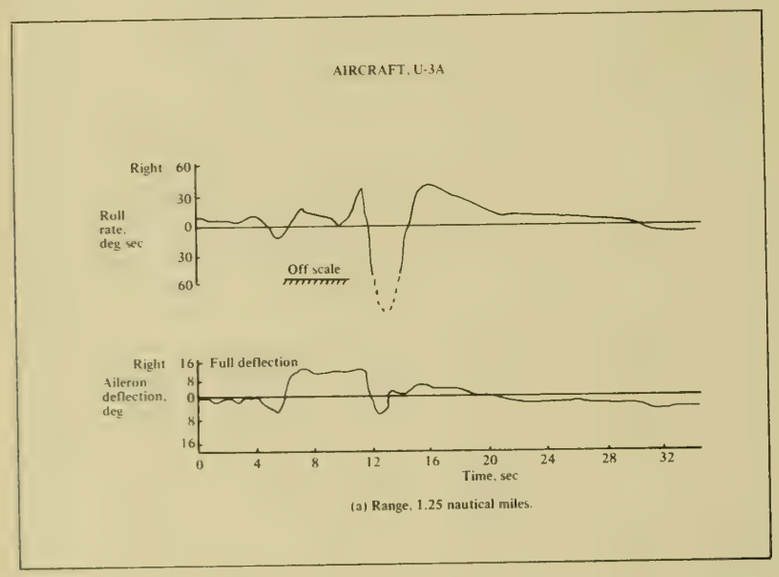
Both of these events were classified incidents but how easily they could have wound up in the *accident* category. Both of them had something in common with so many aircraft accidents: multiple factors, each of which could and should have been better handled. In the case of the T-29, maintenance got into the act for not repairing the fuel gage when they had the capability.

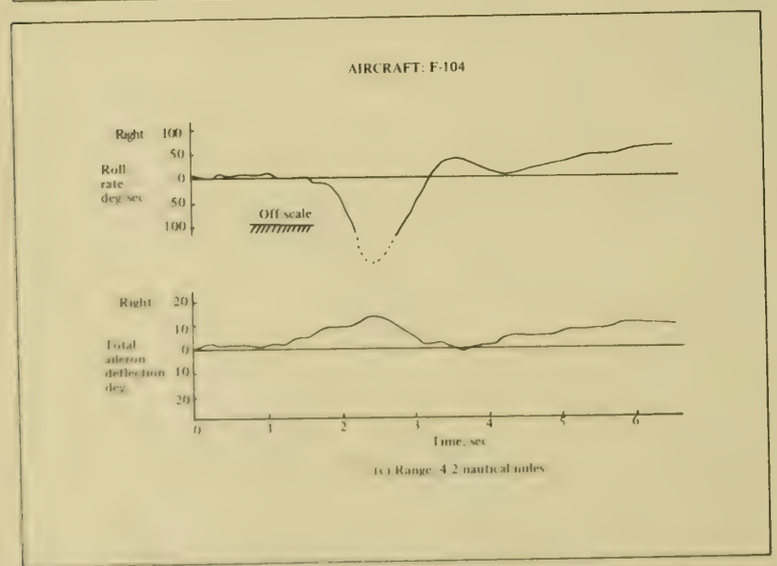
A malfunction of an aircraft component is like a trap. Ever watch an animal approach a trap? He's wary, suspicious and very careful. But if he's very hungry, he may take a chance. Bang! We make the same mistake sometimes when the urge to press on causes us to spring the trap.

Don't do it. ★









Convair 990 probing wing vortex of C-5: airspeed—250 kts. C-5A: airspeed—175 kts, altitude—12,500 ft, gross weight—496,000, clean configuration. U-3A: airspeed—140-160 kts in B-52 wake. F-104: airspeed—250-300 kts in C-5 wake.

W
TUR

Last September a T-38 aircraft on final approach flew into the trailing vortices of a 707 that had executed a go around on a 30 degree bisecting runway. The T-38 pilots were unable to maintain control and were fatally injured in the ensuing crash. The cause was wake turbulence.

One thing about wake turbulence that all pilots should know and appreciate is that roll rate capabilities of all short span aircraft can be exceeded when flying in the vortex of large aircraft.

Both NASA and FAA have been conducting tests in which probe aircraft have obtained wake turbulence data by traversing heavy jet wakes. One of the problems encountered by the probing aircraft was to remain within the wake. The control deflections required to resist ejection from the wake provide a measure of the energies encountered (see charts at left):

- A pilot in a CV 990 used 40 degrees of the available 70 degrees of wheel deflection to maintain control three miles behind a clean configured C-5 at 170 knots. The Boeing 747 vortex generated roll rates of 22 degrees per second, from three to eight miles behind the aircraft, and required the maximum Convair wheel deflection to remain in the wake.
- A Lear jet rolled nearly 120 degrees in one and one-half seconds while flying 3.7 miles behind a C-5.

AKE
BULENCE

Vernet V. Poupitch, Directorate of Aerospace Safety

• A Cessna U-3A at 140 to 160 knots probed the wake of a B-52 grossing 252,000 pounds. At 1.25 mile separation, the Cessna pilot was unable to prevent the airplane from being rolled out of the vortex even though he used full aileron control! The peak roll rate was 90 degrees per second! At five mile separation, the normal acceleration varied from −0.7G to +2.5G. With inadvertent adverse inputs to the elevator when crossing the wake of a heavy aircraft, wing failure will surely occur on a lightplane.

• An F-104 at 250 to 300 knots penetrated the C-5 wake. A roll rate of 170 degrees per second was recorded! On several occasions dur- this type of vortex penetration, the F-104 was actually thrown from the wake and large excursions in airspeed and altitude resulted.

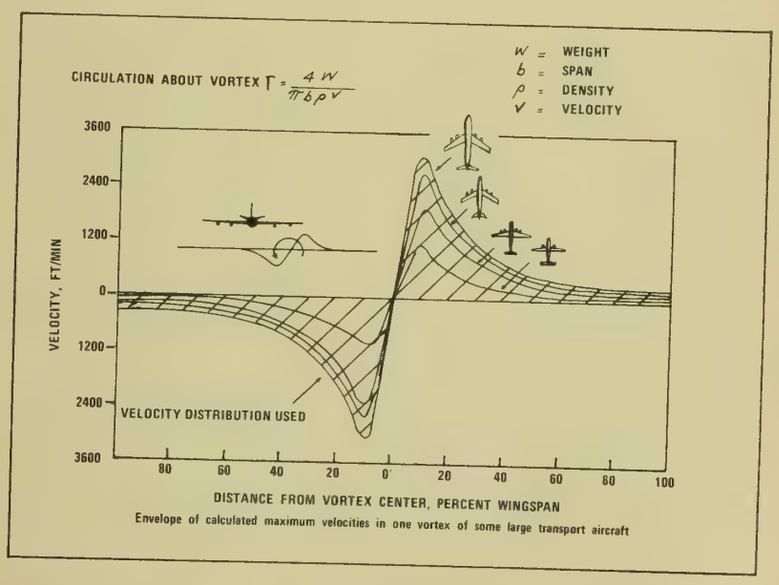
The wake turbulence hazard should not be underestimated. FAA reports 158 general aviation aircraft accidents between 1964 and 1969 where vortex turbulence was a cause factor. One analysis by the National Transportation Safety Board indicates that, where vortex turbulence was a cause factor, 50 per cent of the civil aircraft accidents occurred during landing, 30 per cent during takeoff and 20 per cent while enroute. From this it appears that wake turbulence is most hazardous to aircraft landing and taking off.

Wake turbulence is not easy to identify, according to a survey of experienced USAF fighter, bomber and cargo pilots, and Flight Test Center and NASA test pilots. The objective was to determine if wake turbulence could be distinguished generally from other atmospheric phenomena such as sloping jet streams, wind shear and weather related turbulence. By a large majority, the pilots replied in the negative. Hence, to distinguish wake turbulence from other atmospheric phenomena, without electronic wake detection systems, does not appear to be feasible.

As larger aircraft are introduced, vortex intensity will grow in magnitude and prevalence. Imagine fixed wing aircraft that weigh one million pounds—we will soon be there. To further complicate the pilot's task, more and more helicopters are operating over runways used by fixed wing aircraft. So we can look forward to more turbulence and more exposure to the vortex hazard.

Results from flight tests, theoretical analysis and operational experience have shown that vortex encounters can be destructive, not only to all short span aircraft, but also to those grossing as much as 175,000 pounds. Therefore, wake turbulence is of concern to all major commands.

To cope with wake turbulence it is logical to first learn something of its characteristics so that you can steer clear of trouble. You are, by now, familiar with the size and velocities of the vortex, and you



Envelope of calculated maximum velocities in one vortex of some large transport aircraft

WAKE TURBULENCE Continued

may know that the intensity increases directly with the weight for the same aircraft. Also, among aircraft of equal weight and velocity, the shorter span vehicle will generate the greater vortex circulation. Similarly, any vehicle at the same weight will generate greater circulation at slower airspeed. Experiments have determined that the region of peak velocity in the vortex is at a radius of approximately eight per cent of the wing span from the vortex center. Beyond this, the velocity decays rapidly. Hence, if the vortex were visible, we could at least steer clear of the most dynamic portion. We may soon learn how to do that.

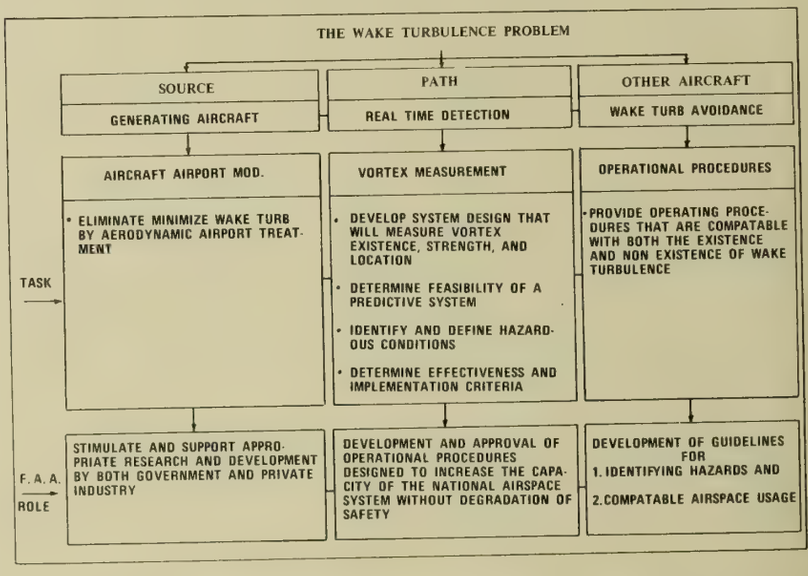
Last October, FAA proposed an ambitious and timely R&D program on wake turbulence with the objective of increasing usable airspace by eliminating or minimizing the effects of wake turbulence. The first step would be a modification program to eliminate or minimize wake turbulence by airport aerodynamic considerations. The second step, selection of a system with real time detection capability to measure vortex existence, strength, and location. Finally, provision of operational procedures compatible with both the existence and non-existence of wake turbulence.

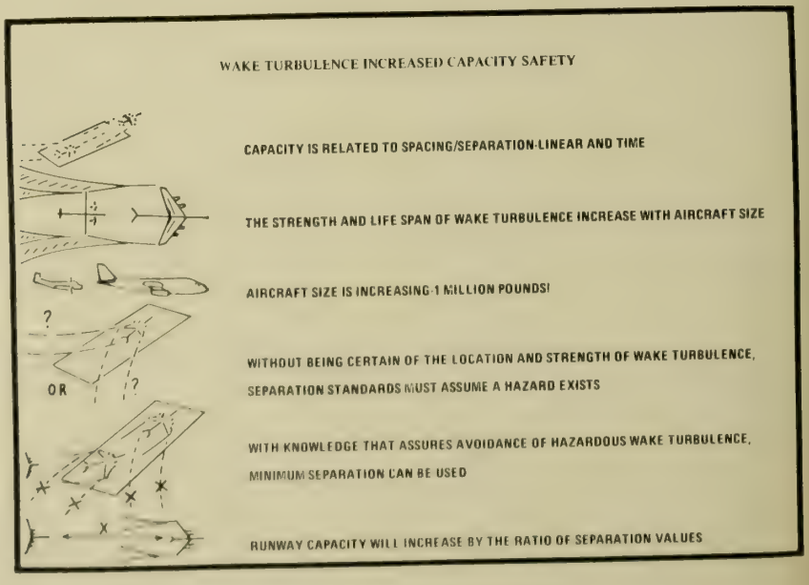
Presently, without being certain of the location and strength of wake turbulence, air traffic control must assume a hazard exists. However, with knowledge that can provide the capability to avoid hazardous wake turbulence, minimum separation can be used.

A wake turbulence measurement system is under development. It might be based on laser devices, accoustical or millimeter radar or infrared systems. Detection might be by emission of non-pollutant particulates by the generating aircraft.

Meanwhile, until we have sensing systems, we must acquire and retain respect for wake turbulence and maintain our separation standard of ten miles and four minutes. Ultimately, a solution will be found and we can look forward to a reduction of separation standards.

(For further information, we recommend ALSAFECOM 21/70 and the film "Wake Turbulence," TF 6568.) ★





OOPS

"Okay, Lead—hit my pods!"



When something that isn't supposed to fall off an airplane does, it's usually because the gadget that was holding it on broke. But friend, the data for that remark was contained in a mighty thick computer run-off, and even though the instances of pilot/maintenance/load crew error represent a minority, it's a pretty hefty minority.

We can do a lot to prevent an inadvertent jettison, right there where the muscle bends the wrench. Imagine an error, and it's been made: over-torquing of supporting bolts, improper wiring, sloppy soldering, inadequate inspection, hasty preflights—the list goes on and on. But it boils down to this: in too many instances, the mechanic shortcuts, ignoring the aids designed to help him, and the inspector places an unfounded trust in the integrity of the mechanic. For example:

A flight of four F-100s was on an air-ground range mission. After practicing rocket delivery, they set up for high-angle bomb delivery. On his first pass, Nr 2 inadvertently jettisoned his B-37K1 bomb rack. About three minutes later, the same thing happened to Nr 4. Inspection showed that, in each case, the live pylon impulse cartridge had been inserted in the aft cavity and the dummy cartridge had been inserted in the forward cavity—exactly backwards from the checklist instructions. A supervisor observed the loading and signed off the red cross, but evidently no one had a checklist.

In another case, the pilot hit the starter button with one hand, punched the clock with the other hand, and pressed the SALVO button with his little finger, leaving his stores sitting on the ramp. He was helped along, however, by an eager crewchief who anticipated the checklist and pulled the pins early.

Good maintenance is the backbone of our operational capability, but slipshod, shortcut maintenance can break that back. Any mechanic knows the value of using the proper tools for a job. One tool that's proper for every job is a checklist. Use it! ★

PILOTS — Meet AiMS

Maj L. S. Franscini, ASD, Wright-Patterson AFB, Ohio

The AIMS modification is being installed in increasing numbers of USAF aircraft. Target completion date is 1 January 1973 for all aircraft in the inventory. Several AIMS prototype aircraft will be in the inventory as one-of-a-kind aircraft for several months prior to fleet modification and TO update. Interim data is being supplied with these aircraft but general distribution is not being made. As a result many aircrew members have probably never heard of AIMS or think "missile" when they hear the word, even though several hundred AIMS equipped aircraft are now flying. Hopefully, at least enough information will be presented here so that complete ignorance of the subject will not exist when you first encounter an AIMS aircraft.

The AIMS Program is the DOD implementation of the FAA improved Air Traffic Control Radar Beacon System (ATCRBS) and the military Mark XII IFF System. This brief article will describe these two functions as they apply to aircrews and describe some of the obvious aircraft changes which identify the AIMS modification.

The ATCRBS portion of the AIMS modification is to update USAF transponder equipment to meet the new FAA air traffic control requirements. For several years now, air traffic controllers have been issuing Mode 3 code instructions in 4 digits, the last two being zero. This was a preliminary to expanding Mode 3/A code capability (Mode 3 is military designation and Mode A civil designation for traffic control mode) from the present 64 codes to 4096 codes. Both FAA and military interrogators are presently being converted to the expanded capability. If you have flown in the New York, Washington, Atlanta, Jacksonville or other terminal areas you may have heard controllers requesting squawks on codes where the last two digits are other than zero from airline traffic.

In addition to the expanded Mode 3/A code capability, an additional mode (Mode C) for automatic altitude reporting is being added. The final configuration of the FAA and military ground radar sites will include automatic processing equipment which will display a discrete code and altitude alongside each radar blip, eliminating the need for voice contact for positive identification and altitude reporting (Figs. 1 and 2).

The AIMS program is providing the airborne equipment required in all Air Force aircraft. A new AIMS transponder with expanded Mode 3/A and Mode C capability is being installed in addition to an altitude source for Mode C. The most obvious cockpit change in an AIMS modified aircraft without vertical scale flight instruments is a new altimeter display (Fig. 3). The counter-drum-pointer display is a great improvement over the three pointer displays now in use and is a fringe benefit of the AIMS program.

In high performance aircraft the AIMS altimeter is the AAU-19/A which is identified by a standby-reset switch on the bezel. This altimeter is a servo-pneumatic device. In normal operation it will be in servo mode and will receive its input from an AIMS altitude encoder-computer or the aircraft CADC. In the event of a servo link malfunction, the failure monitor in the altimeter will automatically switch to standby and operate as a purely pneumatic instrument. A flag on the instrument face appears in standby mode. This design eliminates the requirement for a standby altimeter, required for most servo altimeters. The aircrew checklist will direct that the altimeter be switched to servo mode by placing the standby/reset switch to reset prior to takeoff so that the aircrew reads the same altitude as is being transmitted to the ground. In the servo mode the altimeter is more accurate because its inputs are corrected for Mach by the encoder-computer.

The Air Force has required a maximum altitude system error of ± 250 feet up to 50,000 feet for the AIMS altimetry system. This is a far tighter tolerance than has existed in the past. (Note: Before all the pilots raise their personal minimums, the ± is at cruise altitudes. In order to meet this requirement the accuracy in the approach altitude and airspeed regime is much better, on the order of ± 20 feet).

If during the mod period you get an AIMS modified aircraft and your wingman does not, there may be large differences in indicated altitude. This may be true in either standby or servo mode, for improved static systems are being installed in many aircraft to meet AIMS requirements. The AIMS altitude is the best one.

The method of applying the altitude correction may produce some conflicting indications between the altimeter and vertical velocity during accelerations and decelerations in aircraft that have a large static pressure error. This disparity occurs because the altimeter is corrected and the vertical velocity is not. When aircraft speed is changing, the instrument static pressure error is changing so that, if the change is large, as in some aircraft (e.g. B-52, F-101), the vertical velocity may indicate a change while the altitude computer corrects the error and holds the altimeter reading constant. This phenomenon occurs only in the speed range where the static pressure defect curve has a steep slope and the aircraft is changing airspeed at a fairly rapid rate. This instrument discrepancy presents no problems in aircraft control if the pilot is aware of what is happening and ignores the false indications on the vertical velocity when speed changes are made.

The altimeter in lower performance aircraft is the AAU-21/A altimeter-encoder. The display of this altimeter is the same as the AAU-19/A, but there is no standby/reset switch. The altimeter has a "code off" flag which monitors only the coder function of the altimeter. It is possible to fail to report altitude without the "code off" flag showing, in case of transponder failure or improper transponder control settings.



Figure 1. Present ground controller's scope display

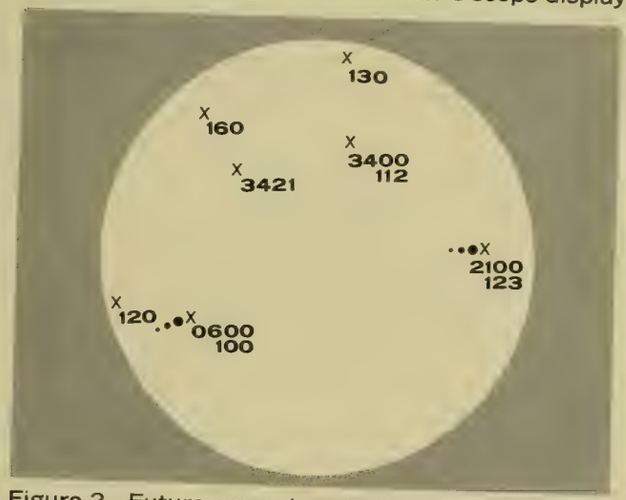


Figure 2. Future ground controller's scope display

The other obvious change in AIMS modified aircraft is a new transponder control (Fig. 4). The functions of the old IFF and SIF controls have been combined into one box and the additional AIMS functions have been added. The most apparent change is the addition of the last two digits to the Mode 3/A selector and the conversion from rotating knobs to thumb wheels.

Aside from the Mode 4 section of the control which will be discussed later, a couple of other goodies have been added. There are four mode select switches in place of the old two. There is now a Mode 1 switch and a Mode C switch in addition to Modes 2 and 3/A. These switches are now three position switches, with a momentary test position. In aircraft with built-in test capability (TS-1843 or similar capability), positioning one of these switches to the test position will light the test light if that mode is operating properly. An additional three position test switch is also provided. In aircraft with built-in test capability, positioning of this switch to MON position will light the test light at any time the transponder is interrogated and replies. The RAD TEST position is for maintenance use and enables the transponder to reply to special test interrogations. The Master switch and Ident/Mic switch are similar to the old control. Position-



Figure 3. Altimeter, servoed, counter-drum-pointer, AAU-19A.

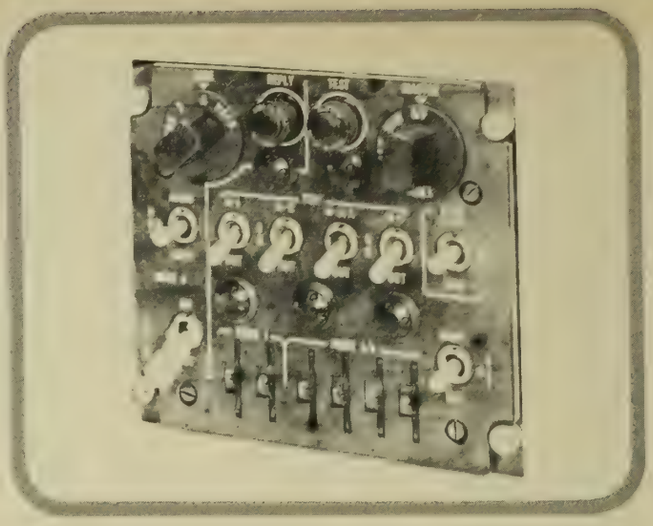


Figure 4. Modified transponder control panel.

ing the Master switch to Emergency automatically squawks civil emergency (Mode 3/A Code 7700) as well as Military emergency. The Master Switch must be pulled outward to turn to emergency position.

The Mark XII IFF portion of the AIMS mod is to provide a secure IFF capability, Mode 4, for military aircraft. This capability is provided by an airborne cryptographic computer which generates coded replies in response to valid interrogations generated by an interrogator cryptographic computer. A keying device, inserted into the computer by maintenance personnel prior to flight, sets two codes, one for the present code period and one for the succeeding code period. Most aircraft are receiving the mounting and wiring provisions for this capability but at the present time the computers are not being installed.

When the Mode 4 computer is installed the aircrew must be aware of the procedures to retain or drop the code after maintenance personnel have inserted it in the computer. The Mode 4 controls on the transponder control consist of a mode select switch similar to the other mode select switches, except that this switch is guarded to the ON position and has no test position. There is also a rotary code switch with ZERO, A, B, and HOLD positions. The ZERO and HOLD positions are momentary and the knob must be pulled outward to turn to the ZERO position. The A position selects the code for the period in which the key was inserted and the B position, the code for the following period. The HOLD position is used after landing to hold the code if another flight is anticipated in the same code period.

When the code is first inserted it is in a "mechanical hold" mode. When the gear is retracted after takeoff the computer switches to "electrical hold" (Fixed gear aircraft will have a cockpit switch to change from mechanical to electrical hold). If the Transponder Master Switch is turned off or aircraft power is interrupted for "five" (5) seconds while in electrical hold the code will zeroize. When the aircraft is on the ground the HOLD Switch position will put the computer back into mechanical hold.

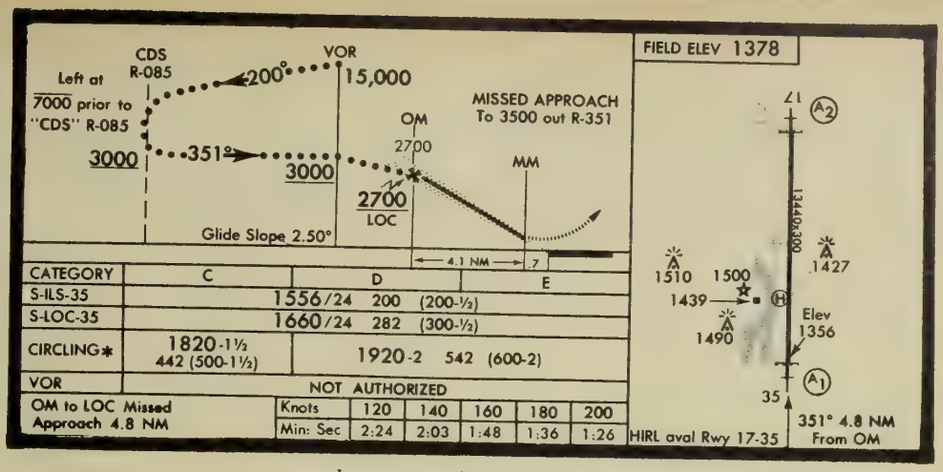
The after landing check on Mode 4 equipped aircraft will require going to the HOLD position for 15 seconds prior to turning off the transponder, if retention of the code is desired. The ZERO position will zero the code anytime it is selected with power on.

The third Mode 4 control is a monitor switch which has AUDIO, LIGHT and OUT positions. The audio position puts a tone in the pilot's headset when the transponder receives Mode 4 interrogations. The light position lights the reply light on the control panel when Mode 4 replies are being made. In addition, an IFF caution light is installed in the cockpit, which lights when valid Mode 4 interrogations are being received but no replies are being generated.

From the aircrew point of view, the AIMS program means a new transponder control and possibly a new altimeter and static system. Aircrews flying those aircraft which have had new static systems installed as part of the AIMS Mod should be aware of the new position error. Operation of the new transponder is essentially the same as before except for the Mode 4 codes. After 1 January 1973, the FAA will require 4096 Mode 3/A codes and automatic altitude reporting for operation above 10,000 feet MSL and in certain terminal areas. For operations in this environment transponders will be set to discrete Mode 3/A codes directed by the controller, much as discrete radio frequencies are issued today. These discrete codes coupled with the automatic altitude reporting will greatly reduce the number of voice transmissions required and improve Air Traffic Control service. ★

THE I.P.I.S. APPROACH

By the USAF Instrument Pilot Instructor School, (ATC) Randolph AFB, Texas



CATEGORY	C	D	E
S-ILS-35	1556/24 200 (200-½)		
S-LOC-35	1660/24 282 (300-½)		
CIRCLING*	1820-1½ 442 (500-1½)	1920-2 542 (600-2)	
VOR	NOT AUTHORIZED		

OM to LOC Missed Approach 4.8 NM	Knots	120	140	160	180	200
	Min: Sec	2:24	2:03	1:48	1:36	1:26

Q Assume you are flying the above ILS approach and fail to start timing at the OM. In the event you lose your glide slope indicator, can you continue the approach to "LOC" minimums, and when would you execute a missed approach, if necessary?

A We know of no reason why you could not descend to "LOC" or circling minimum and continue the approach in the event you lose the glide slope indicator. A missed approach should be initiated at the MM if the runway environment is not in sight or a safe landing cannot be made. The missed approach point (MAP) for a "LOC" approach is normally at the end of the runway; however, using the MM as the missed approach point (MAP) would provide a safe margin for a missed approach or allow a reasonable opportunity for a safe landing. The IPIS recommends, as technique, that timing always be initiated at the OM on an ILS which provides a "LOC" minima and timing information.

CATEGORIES

Q Can I fly a lower category approach, for example: Category E, fly Category D approach?

A No. TERPS (AFM 55-9) recognizes the differences in aircraft performance. These differences have a direct effect on the *airspace* and *visibility* needed to perform certain maneuvers such as circling approaches, missed approaches, corrections on final approach, and descent. This varying performance is reflected by placing aircraft in categories based upon maximum authorized landing weight and/or approach speed. TERPs requires aircraft approach category operating characteristics be used to determine turning radii, minimums and obstacle clearance areas for circling and missed approach. The main difference in obstacle clearance criteria is in the circling approach area. For example: Category E requires nearly twice the area as a Category D. Also, visibility minimums normally differ according to categories. Lower category approaches (Category D, fly Category C approach) may not provide sufficient obstacle clearance or the necessary visibility requirements to safely maneuver for landing.

NON-PRECISION APPROACHES

Q If I am radar vectored to the ILS Final Approach Fix (FAF) and fly an ILS, can I log a non-precision approach for the radar vector in addition to a precision for the ILS?

A AFM 60-1, dated 22 Sep 70, defines an approach as "that segment of flight that *begins* at a *final approach fix* (FAF) and ends at a missed approach point (MAP)." With that definition in mind, *any* maneuvering up to the FAF cannot be logged as a non-precision approach.

RADAR MONITOR

Q What information is furnished by the radar controller on a radar monitored ILS?

A The radar controller will issue the following advisories to the pilot during a radar monitored ILS approach: (1) Over the FAF (normally outer marker), (2) exceeding runway alignment and glide slope safety limits, and (3) passing middle marker or the point where the glide slope intercepts 200′ elevation, whichever is nearer the end of the runway. The last advisory (MM or 200′ glide slope elevation) will consist of the following terminology: "Radar Service Terminated." Since this is advisory information, you can continue to the DH as indicated on your altimeter. However, be aware that the "Radar Service Terminated" statement by the radar controller indicates you are *very near* the missed approach point. ★

Ops topics

"BENDS" (LIKE DROWNING) CAN BE FOREVER, TOO

Last October the copilot of a T-33 experienced an unprogrammed review of his symptoms of bends. The T-Bird was cruising at Flight Level 350 with a cabin altitude of 24,500 feet. After 35 minutes of cruise, events followed this sequence:

1. The copilot felt a "tingling" sensation in his knees, increasing over a period of ten minutes to a state of severe pain.
2. Assuming he had the bends, the copilot selected the "safety" position on his oxygen regulator.
3. Elbow pains developed, and the pilot noted that the copilot's breathing was "heavy."
4. A descent was begun 65 minutes after level off (30 minutes after the onset of symptoms of the bends).
5. During the descent, "It burned to breathe, like inhaling a cigar." However, no chest pains accompanied this sensation. Oxygen pressure was noted to have decreased to 50 psi.

The landing was uneventful, but one hour later the copilot experienced a headache, nausea, and gray, mottled vision. He was admitted to the hospital where the symptoms disappeared after he breathed oxygen for two hours. Fortunately, no permanent brain damage resulted.

An additional problem was a loose ("comfortable") oxygen mask which WAS NEVER TIGHTENED after the first symptoms developed. Hypoxia on top of bends is enough to make the physiological training troops weep! This man was very, very lucky.

The failure of the pilot to declare an emergency and descend immediately is astounding. He listened to the copilot's heavy breathing for 15 minutes before he requested an ARTCC clearance to divert to a nearby base. Then he WAITED FIVE MORE MINUTES for the clearance to be issued! Incredible!

How many other old heads, who look upon the triennial altitude chamber training as a bind, have forgotten the symptoms of bends? Lectures can be boring, but *your* life is the subject under discussion. Review and remember all the symptoms of bends. As soon as one appears in flight, that is the time to take action. If the onset is mild, a lower cruise altitude may be all that you need to relieve the symptoms, but you should still land and be examined as soon as practicable. If you suddenly realize that someone has several symptoms, an emergency descent to the nearest suitable air patch is mandatory. ★

Maj Dave Hook, CAF
Directorate of Aerospace Safety



KEEP 'EM HIGH

A "Keep 'em High" procedure aimed at reducing exposure between high performance turbojets and smaller, slower aircraft has been announced by the FAA.

Where traffic and operational conditions permit, turbojet aircraft will generally be kept at 10,000 feet or higher until they are within 30 miles of the airport. They then will be kept at least 5000 feet AGL until they reach the final turn-on-descent area and are ready to begin maneuvering for an approach to landing.

The procedure will be in effect at FAA's 119 terminal radar control areas by February 1971, at airport towers without radar by July 1971. November 1971 is the deadline for airports without towers that serve scheduled air carrier flights, and February 1972 for all other airports in the U.S. ★

F-4 ALTIMETER PHOTO

An Ops Topic in the November issue, "How High," page 25, included a photo of an F-4 altimeter with a screw-on cap safety chain obscuring the 10,000 digit. The photo was for illustration purposes only and should not be related to the numbers given in the article. ★

FLIP CHANGES

VFR Low Altitude High Speed Routes: Effective 1 April 1971 procedures for operating on the DOD VFR Low Altitude High Speed Training Routes will be changed. These procedures are already in use within the FAA Southern Region (Southeast United States). Suggest that all pilots, who plan to operate on Low Altitude Routes after 1 April 1971, refer to the textual data preceding the FAA Southern Region route descriptions in Section IIA, FLIP Planning. This information, which currently describes procedures for the FAA Southern Region, will be applicable to all DOD VFR Low Altitude High Speed Training Routes after 1 April 1971. ★



LUCKY PIERRE

An old saying in aviation that goes back many years is "There's always a wire." Meaning that, for some reason, there always seem to be utility wires of some kind off the end of every runway. The Air Force has done a pretty good job of eliminating obstacles in the approach zone, but we don't always know what is lurking out there at civil airports. An F-4 crew recently found out at one airport.

They were instructed to hold for 20 minutes while the runway was being changed at an Air Force base. After holding 15 minutes, with fuel getting low, the pilot elected to land at a nearby civil airport. On final the aircraft cut a power line and grazed three unlighted poles. Fortunately damage was confined to dented leading edge flaps.

Here's what investigators found the following morning: no approach lights, VASI inoperative, obstruction lights on power line apparently inoperative, runway threshold lights so sooted over from jet exhaust they were not visible. Add blowing dust which hampered forward visibility so that all the pilot could see was the runway side lighting.

Call these troops Lucky. ★



THEY WALKED AWAY

While strafing a target in mountainous terrain, the F-4 crew steepened their dive angle on the last pass because of trees surrounding the target. As the guns were firing the GIB called "pull" and the AC aborted the pass and pulled the nose up through the horizon. After landing they found one wing damaged as the result of hitting a tree. Another foot or two? No need to say more on this one, except to say there are a lot of names in the file of guys who flew that extra foot or two lower. ★

Toots

is interested in your problems. She spends her time researching questions about Tech Orders and directives. Write her c/o Editor (IGDSEA), Dep IG for Insp & Safety, Norton AFB CA 92409



Dear Toots

TO 00-20-5, para 1-95, states, "All AF bases will give first priority to servicing and maintenance of Air Evacuation aircraft." MM 66-3, Vol II, para 1-4, Work Priorities, gives air vehicles on alert (including ARRS aircraft) maintenance Priority 1, and it gives Air Evacuation aircraft Priority 2.

Please, will you clarify?

Confused
Andrews AFB, MD

Dear Confused

The priorities as listed in the Maintenance Manuals are correct. Alert and ARRS aircraft receive Priority 1. This is as it should be; if the United States were under attack, the alert force would have to be given Priority 1.

As for rescue aircraft, it makes sense that if they are attempting to rescue someone, they would have priority over air evac, inasmuch as personnel on the air evac are already receiving medical attention as opposed to those being rescued.

Regarding the statement in 00-20-5, para 1-95, the last sentence should be interpreted as follows: air evac should receive first priority of all category two priorities. Perhaps you would like to submit an AFTO 22 suggesting a change to TO 00-20-5.

Toots

Dear Toots

What technical publication gives Quality Control the authority to use colored pencils and/or pens to indicate errors on the AFTO Form 781 series forms maintained in the aircraft jacket file? That is, draw arrows, circles, lines and make written comments on the forms when inspecting the aircraft jacket file.

To my knowledge no authority exists to permit this. Quality Control is required by AFM 66-1, para 7-20, to inspect the Record Jacket File currently with the quality inspection following periodic maintenance. Inactive records must be kept on file for a minimum of 60 days IAW AFM 12-50. To confirm my contention I reference TO 00-20-1, para 2-4, and para 2-8.

CMSgt Walter E. Cartee
165 CAMRON, GA ANG
Savannah, GA

Dear Chief

I have consulted several officers who participate in Unit Effectiveness Inspections and find that there is nothing that prohibits the use of colored pencils or pens to identify errors on the AFTO 781 series forms maintained in the aircraft jacket file. Of course, the marks put on the forms must not obliterate any part of the discrepancy or corrective action making it difficult to read. The marks should also be neat and uniform. The two paragraphs you referred to in TO 00-20-1 are aimed at the maintenance of the forms before they are placed in the jacket file. It is generally felt by those in the know, that identifying form errors is good management practice. Of course, identifying the error is only the beginning; something must be done to prevent personnel from making the same errors again.

Toots

REX RILEY'S CROSS COUNTRY NOTES



For many years, departing most bases under IFR conditions was a painful experience. The ATC clearance was complicated and often involved both high and low altitude charts with little known fixes. A climb on course was something to be cherished but seldom seen unless we were departing Boondocks AFB. Then someone came up with the magic solution. Make all departures from a particular base standard. So was born the SID.

Things have changed, however. Almost every departure is now a radar monitor and a climb on course is more the rule than the exception. Besides, if we do receive a deviation we know big brother is watching and the diversion is most likely in the interest of avoiding one of those air-to-air bashes. As a result of all this good service, some bases have neglected a critical review of their seldom-used but still in-effect SIDs. We flew one the other day that gave a radial for departure; however, it did not specify what facility we were supposed to use. The SID was, and in some instances, is a useful system. If your base still uses SIDs, how about taking a look to see if the departure drawn some six or seven years ago is valid? You might be in for some surprises.

ADDITIONS AND DELETIONS

We have received a lot of mail recently from troops in the field concerning transient services at various bases. Most of it was of a critical nature, I'm sorry to say. However, once in a while we hear from a base that is interested in being evaluated for the Rex Recommends List. In such cases, we make a special effort to stop in and do a complete evaluation. If you feel your base can qualify, and you want the award, let us know. We will have some empty spaces soon so there's plenty of room on the list. ★



REX RILEY

Transient Services Award

LORING AFB	Limestone, Me.
McCLELLAN AFB	Sacramento, Calif.
MAXWELL AFB	Montgomery, Ala.
HAMILTON AFB	Ignacio, Calif.
SCOTT AFB	Belleville, Ill.
RAMEY AFB	Puerto Rico
McCHORD AFB	Tacoma, Wash.
MYRTLE BEACH AFB	Myrtle Beach, S.C.
EGLIN AFB	Valparaiso, Fla.
FORBES AFB	Topeka, Kans.
MATHER AFB	Sacramento, Calif.
LAJES FIELD	Azores
SHEPPARD AFB	Wichita Falls, Tex.
MARCH AFB	Riverside, Calif.
GRISSOM AFB	Peru, Ind.
PERRIN AFB	Sherman, Tex.
CANNON AFB	Clovis, N.M.
LUKE AFB	Phoenix, Ariz.
RANDOLPH AFB	San Antonio, Tex.
ROBINS AFB	Warner Robins, Ga.
TINKER AFB	Oklahoma City, Okla.
HILL AFB	Ogden, Utah
YOKOTA AB	Japan
SEYMOUR JOHNSON AFB	Goldsboro, N.C.
ENGLAND AFB	Alexandria, La.
MISAWA AB	Japan
KADENA AB	Okinawa
ELMENDORF AFB	Alaska
PETERSON FIELD	Colorado Springs, Colo
RAMSTEIN AB	Germany
SHAW AFB	Sumter, S.C.
LITTLE ROCK AFB	Jacksonville, Ark.
TORREJON AB	Spain
TYNDALL AFB	Panama City, Fla.
OFFUTT AFB	Omaha, Nebr.
ITAZUKE AB	Japan
McCONNELL AFB	Wichita, Kans.
NORTON AFB	San Bernardino, Calif.
BARKSDALE AFB	Shreveport, La.
HOMESTEAD AFB	Homestead, Fla.
CHANUTE AFB	Rantoul, Ill.
KIRTLAND AFB	Albuquerque, N.M.

TECH topics | BRIEFS FOR MAINTENANCE TECHS

do cold fingers contribute to lost panels?



THE AIR FORCE continues to be plagued with panels falling from aircraft while in flight.

To gain a better insight into the panel loss problem, we called on the computer to give us the statistics for a given period of time—November 1969 through June 1970. Of the 177 incidents reported, 83 had a cause factor of improper maintenance, 89 materiel factor and one was due to battle damage. Four were undetermined.

Perhaps it is significant that, in the cold months, December through March, 93 panels were lost from aircraft stationed in a cold climate. So does cold weather have anything to do with panels falling off aircraft in flight? Well, the rate does seem to decrease as the weather warms up. For instance, the computer lists 29 lost panels for February, 27 for March, 23 for April, 22 for May and 18 for June. Whether this is a coincidence or not we don't know, but any maintenance man who has had to button up an aircraft in sub zero weather can understand how it is possible to miss a fastener here and there when you're eager to get back to the warm shack.

As for the panels lost due to materiel failure, how many of these could have been prevented with proper inspection and, when necessary, replacement of worn and/or damaged fasteners.

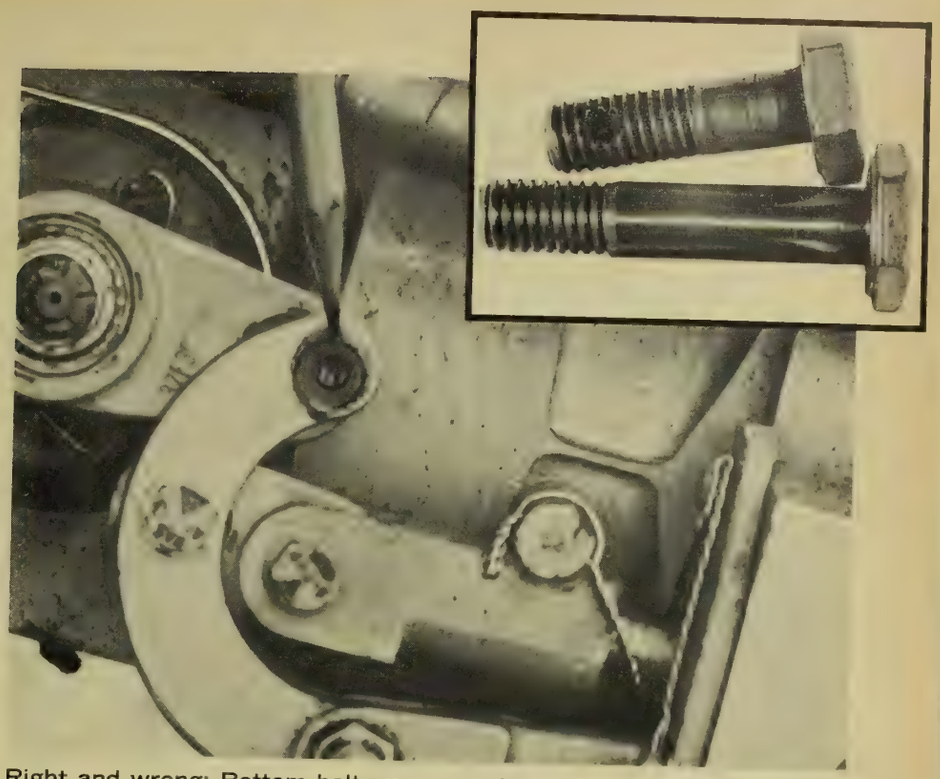
So once again we remind everyone who has anything to do with panels, from the man performing the inspection to the pilot, who might detect a loose panel by tapping it with his hand, if it rattles there is something wrong.

relief valve

WHILE FLYING at 10,000 feet, the crew of a C-131 noticed a high pitch fluttering sound. Suspecting a pressurization problem from an undetermined source, the crew dumped cabin pressure. Back on the ground they found two things. One, the sealant around the base of the VHF antenna was missing; two, there was a three and one-half inch cut in the skin approximately 18 inches in front of the VHF antenna.

It was established that the missing sealant from the base of the antenna was the cause of the pressurization leak. The hole in the fuselage, although not contributing to the pressure problem, because it was surrounded by insulation, was caused by a B-2 stand that maintenance personnel had used to gain access to the antenna. The stand had been positioned too close to the fuselage and when the maintenance men mounted the stand, the additional weight caused the stand to punch a hole in the fuselage. The work was being done at night and the only light used was flashlights. Working around aircraft at night requires proper lighting and extra caution.

wrong hardware



Right and wrong: Bottom bolt was correct one, but top bolt (incorrect) was installed. Photo below shows where bolt fell from.

THE F-84 was number four in a flight of four. Takeoff was normal until about 75 to 100 feet above the ground. Just as the pilot started gear retraction, the aircraft nosed down with the left wing low. It hit on the right side of the runway in this attitude and finally came to rest in a ball of fire some 2265 feet from point of impact. The pilot was rescued by fire department personnel.

This nearly fatal accident was caused by someone who installed an incorrect bolt in the lever assembly to the stabilator actuator control valve arm assembly. The bolt dropped out of the linkage immediately after the aircraft became airborne, resulting in the loss of stabilator control. No maintenance had been performed on the stabilator control mechanism since a combined IRAN and 200 hour inspection was performed by a contractor field team. The bolt installed was a common 10-32 machine bolt in lieu of the NAS 464-3A8 that should have been used. The bolt was also too short; only three threads protruded through the arm and lever assembly, not far enough for the locking mechanism on the nut to engage.

In this accident the pilot survived but the aircraft was destroyed. Next time the pilot might not be so lucky. Make sure you are not the one to contribute to an out of control situation because you used unauthorized hardware.



one jug short

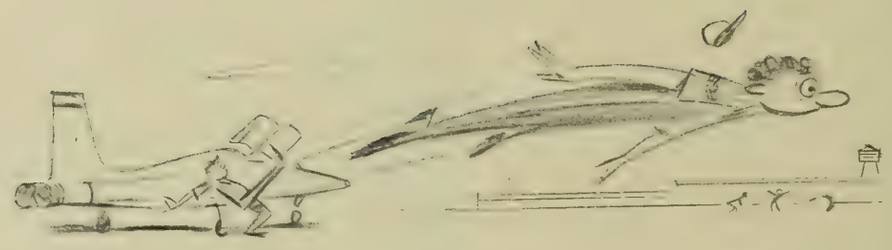
IT IS POSSIBLE to spend your entire Air Force career and never witness a good example of why it is so all-fired important to document every discrepancy. However, once in a while something happens that really drives home the importance of writing it up, as is illustrated by the following incident.

The maintenance crew of a C-131, after towing the bird out of the hangar, were preparing to taxi it to the parking spot. The Nr 1 engine started okay, but in attempting to start Nr 2, it backfired, so the bird was taxied to the spot on Nr 1 engine only.

Investigation revealed the Nr 2 cylinder of the Nr 2 engine was missing. The 781 forms had not been properly documented.

TECH topics CONTINUED

a lousy way to fly



THE T-38 Nr 2 engine flamed out as the afterburners were selected to begin a supersonic run, and the engine would not relight with the normal or alternate methods. After an uneventful single engine landing, it was determined that failure to relight was caused by the main igniter plug. However, the cause of the flameout was something else.

Because the conditions at the time of the flameout were near the limit for afterburner initiation and within the area where rapid or abrupt throttle movements are not recommended, it was felt that rapid movement of the throttle caused the flameout. The instructor pilot, however, maintained that the throttles had not been moved rapidly or abruptly.

After the flameout checklist and test cell runs failed to reveal the cause of the flameout, the aircraft was released for an FCF, during which the engine flamed out. Further investigation revealed that all stator blades in stages 3 through 8 were too short. An analysis of the engine records revealed that the only work done in this area was performed at the overhaul facility.

It is interesting to review the history of the engine from overhaul to flameout. The engine was overhauled (zero time) on 20 July 70 and shipped to Base Nr 1. At Base Nr 1 the engine did not pass the test stand evaluations and did not accrue any flying time. To satisfy a critical engine shortage, the engine was shipped to Base Nr 2 where it did pass the test cell evaluation and was installed on three different aircraft; however, not one of the three aircraft ever made it off the ground with said engine installed, so the engine was removed and shipped to Base Nr 3 for major engine work. At Base Nr 3 the turbine wheel was found to have excessive clearance, and all 55 Nr 2 stage turbine rotor blades were replaced. The engine was then installed on a T-38 and flew satisfactorily for about 35 hours until the incident flameout occurred.

data deleted



SOME SHORTCUTS can be expensive as well as endanger human life. Such was the case of the F-102 pilot on takeoff roll. Approximately two seconds after afterburner light off an explosion occurred, coupled with immediate deceleration. The aircraft was brought to a halt approximately 9600 feet down the runway. The pilot egressed without injury and the fire was brought under control by the fire department. Investigation disclosed that inspection of AB return line elbow, PN 254498, had not been accomplished on the last periodic inspection as required by the TO. In addition the elbow jam nut, PN 231118 was found improperly installed. If you have ever had any doubts as to why you should follow the TO, this should make a believer out of you.

to look but no see



AN F-101 was on a test flight to check afterburner operation. The flight progressed with no discrepancies noted, including two negative G maneuvers to check for foreign objects in the cockpit. However, shortly thereafter, the control stick became restricted momentarily in aft movement. This restriction seemed to disappear, but then almost immediately the stick was forced forward. All attempts to regain control of the aircraft failed, so the pilot ejected at 8000 feet, 450 KIAS, with his zero-delay lanyard connected. The seat-man separator strap jammed in the takeup reel housing and the seat became entangled in the parachute shroud lines. Fortunately, the seat and parachute caught in the top of a tree and the pilot escaped with very minor injuries.

Investigation revealed that the primary cause of this accident was that a pair of water pump pliers had been left in the tail section of the aircraft! The pliers became entangled in the stabilator servo force link, jamming the pitch controls. The investigators were unable to determine ownership of the pliers; however, they concluded that the pliers had lain in the tail section throughout one or more FOD inspections. When checking for FOD, don't let your mind wander, otherwise you may look but not see a very dangerous situation.



short cut

ANOTHER CASE of the *short* cut being the *long* way.

The load crew, with the assistance of the loadmaster, was offloading an R-4360 engine from a C-141 aircraft using a 25K-loader. However, the loadmaster had informed the load crew that shoring would not be necessary inasmuch as he had onloaded the engine without shoring. As the wheels of the engine dolly rolled off the aircraft onto the K-loader, the K-loader rolled away from the aircraft approximately ten inches. The wheels of the engine dolly lodged between the aircraft ramp and the bed of the K-loader. The dolly frame came in contact with the cargo ramp at station 1278, punching two holes in the ramp approximately three inches long and one inch wide.

Investigation revealed the emergency brakes on the K-loader were defective. So, the defective brakes, along with the short cut decision not to use shoring, added up to two holes in the ramp. ★

UNDESI



drugs

C. L. Battistone

"Today I said goodbye to a Marine—more accurately a former Marine, because this young man had just been administratively discharged as an UNDESIRABLE. We took away his uniforms and, wearing civilian clothes, he was escorted through the main gate by the Military Police. His un-

RABLE

desirable discharge was the result of his use of marijuana and LSD and possibly other dangerous drugs.

"Two months ago this man sat in my office and spoke freely about drugs and how he was firmly in control of his habit, was bothering no one and was doing his job in the squadron in a creditable manner. One month later he was required to appear at the squadron administrative office to be advised that he was being processed for an administrative discharge and to sign the service record entries. He showed up —a complete vegetable! Apparently under the influence of drugs or experiencing a flashback from LSD, he was incapable of speaking, had little muscular control and wandered around in a daze, even falling as he was being taken to the hospital for treatment.

"It doesn't take much imagination to visualize what could have happened had this Marine been performing a high-power aircraft turn-up, loading ordnance material, driving a vehicle or otherwise been involved in any number of potentially hazardous duties at the time he suffered this attack. Whether it be operations in peace or war, we in aviation are constantly exposed to situations which require an alert mind, rapid reaction and quick, correct decisions. We *must* be able to trust and depend upon each other.

"Perhaps it sounds like hard drugs are the only real problem. How about marijuana, the innocent, harmless hallucinogen? It appears that even our Congress is currently exhibiting a permissive approach to legalizing marijuana in the United States, in spite of the fact that many other nations have tried it before and experienced grave social problems. Today there is no major nation in the world with legalized use of marijuana. A most concise and informative discussion of the subject can be found in SECNAVINST 6710.1A, along with detailed information on amphetamines, barbiturates, LSD and other drugs of a like nature. Enclosure (3) to this instruction should be mandatory reading for every military man, as it deals factually with marijuana and the user. It concludes with the following paragraph:

" 'Although marijuana may be a mild hallucinogen and the casual one or two-time user may not suffer from its use, as previously observed it is an unpredictable drug usually employed by unpredictable persons. (Chronic users tend to lose ambition, goal-directed behavior, achievement in life and personality maturity.) In the military, he is a danger to himself and his fellow servicemen especially in a combat zone or if he is involved in using moving equipment, military equipment or weapons. It is for this demonstrated *unreliability, incapacitation* of physical functions and *willful* infraction of civil and military regulations that the marijuana drug abuser becomes suspect for continuance in the service regardless of degree of use. As previously stated in notices and instructions to the field, the use of marijuana is dangerous, utterly inconsistent with the military responsibilities of every person in the naval service and is grounds for separation from the service through punitive and/or administrative means.'

"Obviously, aviation, ground safety and the physical and mental health of the individual serviceman suffer when even the 'mildest' of drugs are used by the unpredictable few.

"Today I said goodbye to a former Marine. He left my office with tears in his eyes and an Undesirable Discharge in his hand." ★

(Naval Aviation MECH)



NUCLEAR SAFETY AID STATION



CRACKED CRANES

Subsequent to a reentry vehicle (RV) mating operation, an inspection of the Coles Crane boom was conducted and several cracks were found in welds of the inner boom section. Another Coles Crane was inspected and several cracks were found on the welds in the same location. Repair procedures and technical assistance were immediately furnished by the depot. A follow-on X-ray inspection of the boom sections was performed on the same two cranes and numerous other cracks were found. The cracks which were not visible without the use of X-ray were in various stages of propagation, and ranged in length from one-half to three inches. The importance of strict compliance with inspection procedures specified in TO 33-D4-2-43-1 for L3010 Coles Cranes cannot be overemphasized. The consequences of handling nuclear munitions with defective or unsafe handling equipment can be serious. The true professional will always take time to ensure that Aerospace Ground Equipment is in A-1 condition prior to use in nuclear weapon operations.



STOW YOUR CHOCKS

An RV G&C van was immobilized because the clutch couldn't be disengaged in the RV tractor. A National Defense Area was established. The Wing Commander, Wing Director of Safety, and Wing Nuclear Safety proceeded to the scene and discovered a wooden wheel chock had slipped between the clutch linkage rod and the spare tire rack. The wheel chock was removed and the clutch disengaged. All equipment was checked and the wheel chocks were stowed in the right floorboard area of the RV tractor. You can be sure that the Wing Commander provided choice guidance on the subject.



The left rear outer wheel came off an RV G&C van during its return trip to the support base. The va was stopped and maintenance assistance was requeste by the maintenance team. No other damage was sus tained by the van or its contents. A new hub and whee assembly was dispatched to replace the wheel tha came off and the van proceeded back to the suppor base with no further trouble. Investigation revealed tha all six wheel studs had been sheared. A check of th



JUST A REMINDER

The season of inclement weather is upon us. Road hazards relative to weapon system convoy operations will increase. Last season the USAF was involved in at least two mishaps involving RV G&C vans where road and weather conditions were a contributing factor. Fortunately, the resulting damage to USAF equipment was minor, but the potential for serious consequences was present. In each incident, there were indications that the exercise of good judgment by the vehicle operators was questionable. The use of sound judgment and extra precautions during inclement weather conditions can preclude recurrence of mishaps such as those that occurred last season. BE ALERT for safety.

HEEL
ELL
FF

ntenance records indicated that the van was over- for scheduled inspection. However, it was the only available for dispatch. Compliance with torquing cedures in TO 36A9-8-40-1 and the inspection cedures in TO 21M-LGM30F-4-4 should insure a able wheel and help detect any serious material ciency that may exist. The importance of properly rquing the wheel retaining nuts, when required, ot be over-emphasized.



BE ALERT

The munitions maintenance team had just positioned a reentry vehicle (RV) in the forward area of an RV van. As one team member moved the hoist toward the rear of the van, the loop formed by the power cable unexpectedly caught the RV nose cage assembly and bent it. This caused the upper collar of the cage to break off the nose tip of the RV. Had the team members been alert to their responsibility to detect potential accident/incident situations, this incident could have been prevented. The ability to anticipate and properly respond to unsafe conditions and situations such as this is an indication of the true professional. Be alert during the conduct of *all* operations involving nuclear weapons.



F-104G

A movie released not too many years ago, starring Steve McQueen, had the following line, "What we have here is a failure to communicate." Unfortunately, this line can be applied to many real life situations which result in mishaps. A recent example was the breaking of pulse plug break pins during a downloading operation. The failure to communicate which contributed to the situation was the failure to provide the user nation load crew personnel with a translated version of a technical order change. Changes to technical data must be in the hands of all affected personnel in a language they can understand. However, don't apply the failure to communicate idea only to the "language barrier." The failure to communicate can just as easily occur between two persons speaking the same language if they're not careful!

train 'n train

Personnel error persists as the major cause of explosives accidents. A review of accident and incident reports reflects a lack of respect for explosives hazards, which may be the result of inadequate explosives safety training. Frequently, persons who lack the proper training are given a job to do and are then not properly supervised.

Training and retraining must be administered effectively to improve the proficiency and utilization of personnel. Significant improvements can be made by:

- Reviewing and updating on-the-job training programs, incorporating essential exposives safety principles.
- Including explosives safety in supervisory training.
- Using explosives accident/incident reports to identify training needs.
- On-the-spot retraining of personnel who violate safe job procedures.
- Establishing explosives safety information files as mandatory reading.
- Providing demonstrations when explaining new procedures or modifications, or the use of new equipment.
- Using commander's calls, section meetings and maintenance and operations briefings to maintain the personal contacts vital to safety efforts.

To be successful, an explosives safety program needs persons responsible for explosives safety training who are aggressive, ingenious and persistent, staff officers who appreciate the role of the explosives safety program in unit effectiveness, and commanders, supervisors and safety officers who provide their active and visible support.

Explosives accidents due to personnel error must be, and can be, eliminated. Anything less is unacceptable. ★

EXPLOSIVES SAFETY

John H. Kawka
Directorate of Aerospace Safety

MAIL CALL

EJECTION

In *Ops Topics* for October you mentioned a "Don't Eject Light." Although the idea has much to commend it, I feel that it might be an unsafe act in itself. If a pilot has an F-4 in a situation which raises the question of ejection for the back seater, that pilot is probably pretty busy and doesn't have time to look at the very small green lights on the UHF radio panel. The pilot is better off devoting his attention to the aircraft's problems, or, if out of control at low altitude, initiating the ejection sequence for both crewmembers (granted the RF-4 accident cited is an exception for sequenced ejection). Too many PSOs have stayed with the aircraft too long waiting for the front seater to decide they should eject.

Capt Clifford R. Krieger
Wright-Patterson AFB, Ohio

You have a good point, Cliff; however, the author based the item on a procedure that was used successfully in a unit to which he was formerly assigned. Perhaps a better system could be designed into future two-seat aircraft.

BEEPER SNOOPER

With the return of the venerable old T-Bird to Nellis, came an unexpected headache. The seat pack beeper radio (URT-27) is prone to accidental actuation and cannot be turned off without popping the parachute. The big problem is finding the chute that contains the culprit.

Our squadron does not have a "beeper snooper" (field strength meter) to find runaway beepers, so we dreamed up a hunting system which is primitive but effective.

The RT-20B radio, which is the training version of the RT-10 Survival Radio, is tuned to 253.4 mc. However, when it is held about four feet from an operating beeper, the Guard signal bleeds into the I.F. strip of the RT-20B.

We placed the RT-20B on a counter about 20 feet away from the parachute rack after discovering that it sang loud and clear in the P.E. room. Then one by one, we carried each parachute out to the counter. Our problem was easily solved.

Since the RT-10 and the URT-27 beeper signals both bleed into the training radio, we assume that other survival and beeper radios now in the field will do likewise.

Capt Art Schneider
429th Tac Ftr Sq
Nellis AFB, Nevada

This "beeper snooper" is one of many local innovations devised by units to locate inadvertently actuated personnel locator beacons. SAAMA advises that the DRF-2 Locator, FSN 6625-403-7989CX, will be available for requisition in August 1971. The DRF-2 will be added to the TA 450.

CADMIUM CARE

One statement in the article "Cadmium Care" in the November 1970 issue was misleading—"Nickel-plated tools are embossed '21C' for identification."

21C is not an identification for nickel-plated tools as opposed to cadmium-plated tools. That number is the identifying prefix for part numbers of General Electric, Lynn, Massachusetts, aerospace ground equipment.

There were, several years ago, some cadmium-plated 21C tools available for use on GE-Lynn engines that had titanium parts, but these tools were recalled, stripped, and replated with nickel.

A General Electric JET SERVICE NEWS article in October 1968 covered this subject and suggested that TOs be used to determine which 21C tool should be used in which application to help to prevent misapplication.

While it is true that cadmium reacts detrimentally with titanium as described in the article, a survey of all General Electric tools showed that none are cadmium-plated in any area that will contact titanium engine parts.

Joseph J. Atkinson, Jr
Editor, GE Jet Service News

FAHRENHEIT TO CENTIGRADE

In the October 1970 issue on page 32 there is a simple method to convert from Centigrade to Fahrenheit. There is also a method to convert from Fahrenheit to Centigrade which may not be obvious to many people.

F, sub 32, add 1/9, divide by 2.

```
Exam.  212   F
 #1    -32   subtract 32
       180
        20   add 1/9
   2 ) 200   divide by 2
       100   C

Exam.   50   F
 #2    -32   subtract 32
        18
         2   add 1/9
    2 ) 20   divide by 2
        10   C

Exam.  -40   F
 #3    -32   subtract 32
       -72
        -8   add 1/9 (watch the sign)
   2 ) -80   divide by 2
       -40   C
```

CONTINUED

27(2)

MAIL CALL CONTINUED

I hope this might help; in addition I would like to add that example one, the boiling point of water is the best reference for the two temp scales when one is in doubt as to which way to calculate.

Sgt John W. Benson
Minn. ANG

UNDERSTANDING AND USING GROUND EFFECT

I would like to reply to a letter in your August Mail Call regarding "Understanding and Using Ground Effect." Although I do not have test data to refute or confirm the stated change in the Maximum Lift Coefficient, and since I am loath to stall my aircraft in ground effect, I think we should remember the established facts about ground effect as they pertain to various conditions of flight.

As discussed in your May issue, when an aircraft is very close to the ground, you achieve a reduction in the induced coefficient of drag and induced angle of attack for any specific lift coefficient. In this condition, the wing will require a lower angle of attack to produce the same lift coefficient (C_L) as shown in Figure 1. Also, since induced drag predominates at low speeds, the most significant reduction in thrust occurs only at low speeds such as at takeoff or touchdown (Figure 2).

Descending Into Ground Effect. When an aircraft descends into ground effect:

a. A smaller angle of attack will be required to produce the same lift coefficient. If a constant pitch attitude is maintained, an increase in total lift will occur which can result in "ballooning."

b. The thrust required at low speeds will be reduced.

c. There will be a nose down change in pitching moment.

d. In the majority of cases, there will be a change in the position error due to increased pressure at the static sources. This results in a lower indication of airspeed and altitude.

Ground Effect on Landing. If an aircraft comes into ground effect maintaining a constant angle of attack, the aircraft will experience an increase in the coefficient of lift and a reduction in thrust required. Hence, a "floating" sensation may be experienced. Because of the reduced drag, any excess airspeed prior to touchdown may incur a considerable "float" distance. In addition, aerodynamic braking will be of greatest significance only when partial stalling of the wing can be accomplished.

Ground Effect During Takeoff. An aircraft leaving ground effect will:

a. Require an increase in angle of attack to maintain the same coefficient of lift;

b. Experience an increase in induced drag and thrust required;

c. Experience a decrease in stability and a nose-up change in moment; and

d. Usually experience a reduction in static source pressure and an increase in indicated airspeed.

These general effects should point out the possible danger in attempting takeoff prior to recommended airspeeds. As an aircraft rises out of ground effect with a deficiency in airspeed, the increased induced drag during the climb may, in extreme conditions of high gross weight, density and temperature, permit the aircraft to become airborne but be incapable of flying out of ground effect and may settle back to the runway. Ground effect can be used to advantage by using the reduced drag to improve initial acceleration.

As was stated before, I also feel the phenomenon of ground effect is generally misunderstood. Although its effect will vary with aircraft type and operational procedures followed, I feel all pilots should be cognizant of the above-mentioned facts.

Maj L. J. Crabb
Canadian Forces Flying Training Standards Unit
Westwin, Manitoba

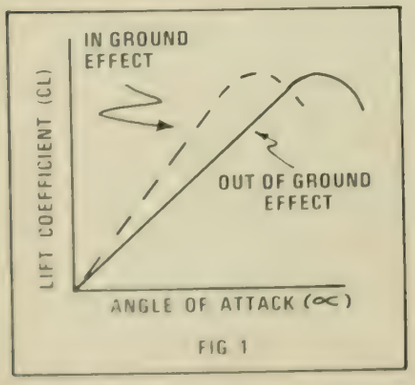


FIG. 1

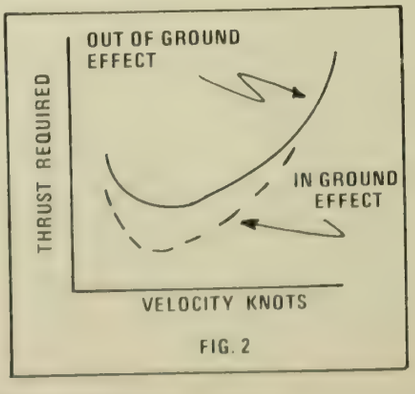


FIG. 2

☆ U.S. GOVERNMENT PRINTING OFFICE 1971 431-461/6

UNITED STATES AIR FORCE

WELL DONE AWARD

Presented for outstanding airmanship and professional performance during a hazardous situation and for a significant contribution to the United States Air Force Accident Prevention Program.





ACROSS AND DOWN

Lt Col James T. Sidlo
PILOT

Maj Robert O. West
COPILOT

Maj Ernest G. Vorwerk
NAVIGATOR

SSgt Jose Salinas
FLIGHT ENGINEER





922nd Tactical Airlift Group, Kelly AFB, Texas

Lt Col Sidlo and crew were dropping Texas Army National Guard troops from a C-119 at "Rapido" Drop Zone near Waco, Texas. They landed at the municipal airport to pick up the DZ Safety Officer. The subsequent takeoff was normal until the pilot called for meto power. As the throttles were being retarded, Nr 1 propeller ran away to approximately 4000 RPM and airspeed dropped from 140 knots to 110-115 knots. Altitude was held at 100-200 feet AGL, and all emergency procedures were correctly executed; however, with no effect on the runaway propeller. Neither altitude nor airspeed could be increased in a straight ahead flight path. The decision was made to turn back and land downwind. Since rudder control was inadequate, the right wing was lowered 5 to 10 degrees to maintain direction, and Nr 2 engine was increased to maximum available power, much beyond maximum allowable power which had proven insufficient to maintain flight. Lowering of the gear to crash land straight ahead was considered; however, Lt Col Sidlo was able to fly the aircraft to a safe landing on the runway.

Professionalism and excellent aircrew coordination safely returned a combat ready aircrew and aircraft undamaged. WELL DONE! ★

Hi-



let's get togethe
on page 2. It'll b
worth your time..

I promise

Our thanks to lovely Diane Hanson and the Weber Aircraft Co., which supplied the ejection seat.

9.1305
LYS

Aerospace SAFETY

UNITED STATES AIR FORCE • MARCH 1971



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COVER PHOTOGRAPH BY SSGT ROBERT WICKLEY, AEROSPACE AUDIO VISUAL SERVICE.

UNITED STATES AIR FORCE

Aerospace SAFETY

FOR AIRCREWS, MAINTENANCE & SUPPORT TECHNICIANS

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DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USA

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BRIGADIER GENERAL ROBIN OLDS NEW DIRECTOR OF AEROSPACE SAFETY

Brigadier General Robin Olds, former Commandant of Cadets, U.S. Air Force Academy, has been assigned Director of Aerospace Safety. He replaces Brigadier General Benjamin H. King who retired 1 February.

General Olds graduated from the U. S. Military Academy on 1 June 1943. During World War II he flew 107 combat missions in P-38 and P-51 aircraft, destroying 13 enemy planes in the air and 11 on the ground.

In the years after World War II, General Olds served in a number of assignments here and abroad. He was one of the first American jet pilots, flying the P-80 at March AFB in February 1946. He was wing man on the first jet acrobatic team in the Air Force and he won second place in the Thompson Trophy Race (Jet Division) at Cleveland in 1946. General Olds participated in the first one-day, dawn to dusk trans-continental round trip flight in June 1946 from March Air Force Base, California, to Washington, D.C.

General Olds returned to combat in October 1966 when he began flying missions from Ubon Royal Thai Air Force Base in F-4 aircraft. He flew 152 combat missions and destroyed four MIGs over North Vietnam.

As Director of Aerospace Safety, General Olds is responsible for USAF accident prevention and investigation programs for aircraft, missiles, ground and explosives safety. ★

IT'S EASY ON MONDAY



Monday morning quarterbacking has become, through careful development, one of our most enjoyable indoor sports. We attack the problem or occurrence which happened several days ago with confidence, expertise and a critical eye. It takes at least two to play, because to really enjoy the game we have to have someone else around to bounce our ideas off of to see how well we've developed our approach. Almost invariably we can solve the problem in a much better manner than the individual personally involved. In other words, twenty-twenty hindsight is a gift denied no one and any number can play.

In the safety business, we think Monday morning quarterbacking has its place. If someone commits a faux pas we like to air it, not for the purpose of embarrassing the culprit but in the fervent hope that from this poor guy's mistakes we may perhaps learn a lesson the easy way.

Safetywise, 1970 was a banner year. Through the efforts of everyone in the USAF, we managed to break the magic barrier of a 4.0 accident rate. The 3.0 accidents per 100,000 flying hours was the lowest rate in the history of military aviation. Okay, take your bow, but look out while you're doing it that something doesn't catch you from behind while you're in that position. Resting on our laurels is one sure way of guaranteeing we stay where we are or, more likely, go back to the 4.0 plus.

It doesn't take a mental giant to determine from the statistics where our accident potential is the greatest. Anyone remotely interested in safety will admit that pilot factor claims a lion's share of the accidents which occur each year. In the education business, we are talking not about pilot factor as a gross figure but, instead, breaking it into bits and pieces that are more easily digestible. In one of our current issues, we talked about the failure of a pre-decision—ejection vs. forced landing (*Aerospace Safety*, February 1971). This is always a meaty subject for our post mortems because everybody has an opinion on this one. Having already kicked this subject around for a few pages, let's now take a look at another pre-decision we should store away in our mental computer: At what point do we decide whether to abort or press on with our takeoff?

In hopes that you can learn something from others' misfortunes we



are going to brief some accidents that might have been prevented had there been preplanning or forethought. Most of the information is verbatim; some has been paraphrased but the facts are all there.

F-4D MAJOR

The takeoff roll and liftoff appeared to be normal. Immediately after becoming airborne, the copilot felt there was a lack of acceleration and a leveling of the aircraft a few feet above the ground. A check of the airspeed indicated 200 knots. When asked what was wrong the pilot said he didn't know. When advised the nose was gradually lowering toward the runway the pilot raised it. The aircraft touched down in a normal landing attitude, right of centerline after being airborne about 3500 feet. The drag chute was immediately deployed with the airspeed at 180 knots. The pilot transmitted that the throttles were at idle, barrier hook was down, and he was aborting the takeoff. Five seconds later he again stated he was aborting and was going into the barrier. The departure end BAK-12 barrier had been removed for maintenance (and was NOTAMed out). The aircraft passed the barrier still maintaining 180 knots. After departing the runway both main tires were blown.

The copilot observed the overrun behind him and obstacles ahead. He stated, "I'm ejecting," and pulled the face curtain. The ejection occurred with the aircraft in a slight nose-high attitude, airspeed 150 knots, at ground level. The seat attained an altitude of 200 feet and the parachute opened immediately after seat separation. The parachute was slipped away from the fireball and the pilot landed in some trees. The risers were released immediately and he fell about five feet. The survival kit restraining strap caught on the tree and stopped his fall. It was released and he fell about eight feet to the ground. He sustained superficial abrasions. The aircraft struck the ILS course array antennas, mounted on a three foot embankment, almost simultaneously with his ejection.

The external fuel tank exploded and the aircraft bounced across the ground. It went over a cliff and burst into flames. The pilot did not attempt ejection. *He probably did not recognize the hopelessness of the situation and could have been seeking a solution that would save the aircraft.*

Commentary: Why abort anyway? We wonder how many accidents we have had where there was nothing wrong with the bird except "it just didn't feel right"? This seems to be especially true in fighter aircraft. In this case, the rear seater realized the futility of staying with the machine and is around today. Another little factor, the barrier was NOTAMed inop—supervisory factor played a part in this one as the pilots were not specifically briefed on the barrier status. Had this fact been clear in his mind, the pilot might have taken a different course of action. Notice that the GIB ejected at ground level, 150 knots, with a slightly nose high attitude. Put yourself in the pilot's position and decide what you would have done. You probably haven't been there yet but someday you might be! !

F-100 DESTROYED

The F-100D was lead of a two ship flight departing on a day cross-country aircraft delivery mission. At about the 1500 foot line the nose wheel began to shimmy. At 145 knots the pilot decided the aircraft was not accelerating properly and would not become airborne, so he aborted.

The nose gear collapsed prior to the MA-1 barrier. The pitot boom passed under the MA-1 pendant and caused it to go over the drop tanks.



IT'S EASY ON MONDAY

The drop tanks were torn open and fuel spilled out. The aircraft was still moving forward with smoke and fire on both sides. When forward motion ceased the cockpit area was engulfed in flames. The elastic characteristics of the BAK-9 tape pulled the aircraft backwards approximately 100 feet and out of the flames. When it stopped, the flames again covered the cockpit area. The pilot contemplated waiting for the fire fighters but saw an area clear of fire and decided to evacuate the aircraft. He used his right hand to release the restraining straps while simultaneously raising the canopy electrically with his left hand. The canopy was slow in raising. When it was sufficiently high the pilot exited over the right side.

Commentary: This is another one where the pilot survived but the bird was destroyed. The investigators decided that the pilot was at fault in that he delayed his decision to abort. An interesting contributing factor—"unit personnel non-compliance with TOs resulted in an airspeed indicator malfunction. The pitot drain line ruptured due to trapped water and a hard freeze."

Do you depend entirely on the airspeed or do you use other gages to determine when to go or abort? Do you suspect pitot problems when all the engine gages are normal? Did the pilot compute his line speed? If so, this figure should have suggested an airspeed malfunction. If not, was it better for him to attempt a zoom and a boom or to take the action he did? It's easy now to look back and say, "Okay, the aircraft is going to be destroyed anyway, why ride it out?" Do you know the capabilities of your egress system well enough to determine where you can and cannot expect to have a successful low altitude ejection?

B-52 DESTROYED

The B-52D was the last aircraft in the second cell to launch. At 70 knots on the pilot's airspeed indicator the copilot's instrument read 85 knots but abort was not called for IAW the Dash-One. At 95 knots the copilot read 105 knots and the takeoff was aborted. There was a delay in deploying the drag chute and putting the air brakes at position six; this plus water on the runway (hydroplaning) prevented a stop on the runway. The pilot attempted to turn off the runway onto a taxiway prior to the end but the aircraft left the side of the overrun,, broke up and was desroyed by fire/explosion. All six crewmembers escaped.

When the pilot attempted to turn into a taxiway, during the abort, the forward trucks went off the side of the overrun and collapsed. Structural break-up occurred. The gunner jettisoned his turret just as the "abandon aircraft" light came on. The seat belt and shoulder harness released normally. While removing the parachute, one side hung up momentarily on his LPU. More difficulty was experienced in unhooking the oxygen hose connector from its attachment. Most of these problems were due to panic. The escape rope was deployed and he started down. He lost his footing and slid 15 feet to the ground. He was not wearing flying gloves and sustained second degree friction burns to both hands.

The EWO attempted to manually unlock and discard his escape hatch. It would not release so he stood up and pushed it open, but could not find the escape rope. After holding the hatch open for the two navigators he slid down the side of the fuselage. The escape took about one minute. On ground impact the zippers on his quick don flying boots popped open. He then got away from the burning aircraft.

The navigator was delayed in exiting because his left foot was momentarily caught under the seat. The oxygen hose or interphone cord was across his chest and caused about a three-second delay in removing the parachute harness. He discarded his helmet and went out the EWO's hatch. He also was not wearing flying gloves. When he reached the ground, after sliding down the side of the aircraft, the zipper came open on his left boot. It took about 75 seconds for him to get out.

The radar-navigator released all restraints, discarded his parachute, and went to the EWO's hatch. Again no gloves. He didn't attempt to find the escape rope but slid down the side of the fuselage.



The copilot discarded his parachute and helmet and went out the EWO's hatch. He made no attempt to use his primary emergency exit. His escape took about 90 seconds.

The pilot attempted to contact the crewmembers on interphone after the aircraft stopped. When no answer was received he proceeded to the lower compartment. Finding it empty he returned upstairs and went out the EWO's hatch. He retained his helmet but not his gloves. It took about two minutes for him to get clear of the aircraft. All crewmembers were picked up by ground vehicles. A jet engine mechanic sustained minor injuries when the internal weapons exploded ten minutes after the accident. He was struck in the face by a fluorescent light bulb guard.

Commentary: Okay, so the pilot was slow in deciding to abort. Had the crew, I wonder, determined how much more distance was required to abort due to the wet runway? It is a factor, you know, and obviously a rather critical one. Egress from the burning aircraft was a total farce. It seems to us, in retrospect, that the mere desire for self preservation would compel an aircrew member to know thoroughly his egress procedures. I'll bet this crew knows how to do it now.

We could go on and on with abort briefs but these are rather representative of those that have occurred over the years. They follow a general pattern, and point to a lack of knowledge on the part of the aircrew of either their abort procedures, or their ejection system, or of their egress procedure. Granted, one of the most difficult tasks is to decide whether to press on when things don't feel right or to attempt to stop it on the runway with drag chue, brakes and barrier. One conclusion is that if you can't stop the machine on the runway, chances are there will be a major accident in which somebody is going to get hurt or killed, and the airplane may end up as a total loss. Beyond a certain point the pilot has little or no control over the end result.

We pay a lot of lip service to our egress training, but it's obvious that too many of our crews don't know how to get out of their aircraft in a hurry. Sure, there's a chance you will sometime find yourself in a panic situation, but if your procedures are sound, your actions will be automatic. Give yourself and all those with you a little extra margin of safety and *know* how far down the runway you can go and still stop on the concrete. Make sure everybody knows how to rapidly evacuate should this become necessary. The price for this information is free and the dividends high—your life for a few minutes of preplanning. ★

While this article refers specifically to the F-5, and the performance figures are for the F-5 only, the principles discussed apply in general to all high performance aircraft. Recommended reading for fighter pilots.

GLIDING

C. H. Vance
Senior Performance Engineer
Northrop Corp.

The Director of Aerospace Safety recently reported that, during the past 22 months, there were at least 22 cases in which USAF aircraft ran out of fuel and 13 cases where the engines flamed out because of fuel starvation due to a system malfunction. The majority of the fuel problems occurred during scheduled training and cross-country flights. Most of the pilots involved were experienced, and many were instructor pilots or flight leaders. It was interesting to note that many of the critical fuel situations became major accidents within sight of the intended landing field. The majority of these situations occurred during night navigation flights in adverse weather conditions or when circumnavigating severe weather and overextending the aircraft range. There were no F-5 aircraft involved.

An insufficient fuel situation is an emergency condition and should always be treated as such. It doe not mean instant disaster. However it does require some instant thinkin and a thorough understanding o the aerodynamic aspects of power off gliding flight. The purpose o this article is not to tell you how t avoid a minimum fuel situation bu how to get the most from your air craft and remaining fuel if the situa tion should arise.

Do you know how far the F-5A can glide? The effects of wind o glide airspeed? Can the glide dis tance be stretched by reducing th sink rate or increasing the angle o attack to reduce sink rate? Which more critical in obtaining maximu glide distance, a higher airspeed o a minimum sink rate? How abou the effects of gross weight or ma neuvering flight? And most impo



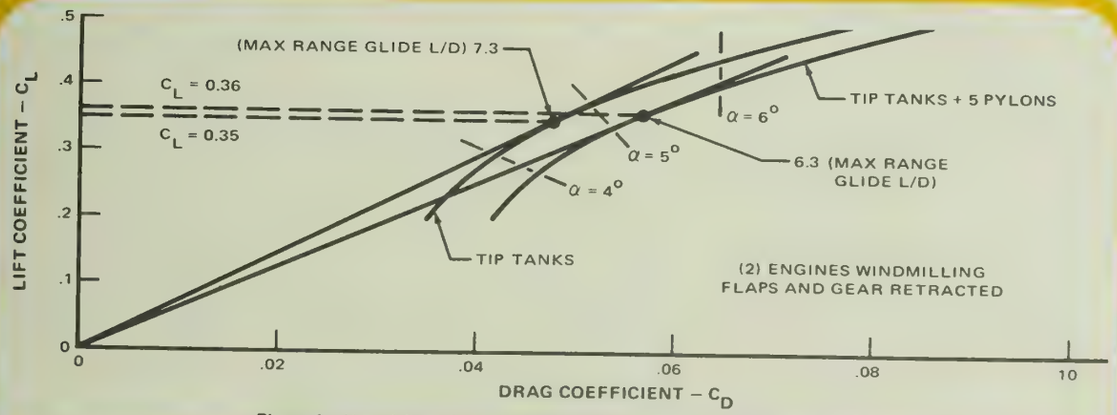


Figure 1. Use of Drag Polar for Determination of Maximum Range Glide Speed

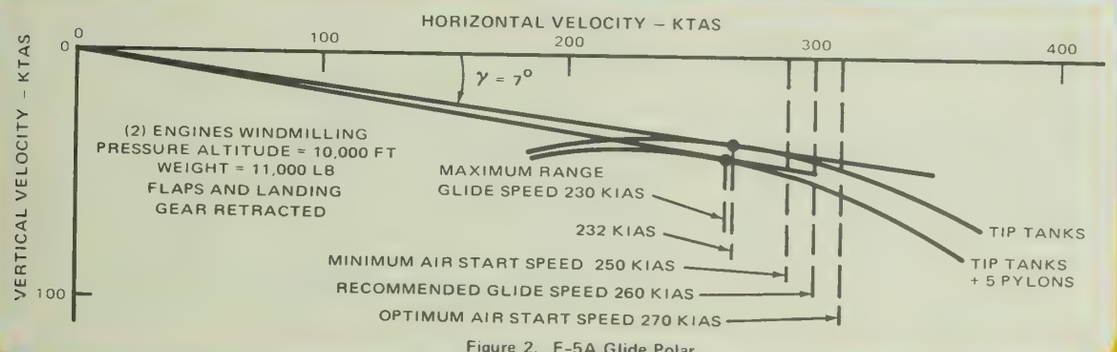


Figure 2. F-5A Glide Polar

tant, can a power-off flare and landing be safely negotiated if it becomes necessary?

The primary concern to the pilot is not how to achieve the least amount of sink rate but how to achieve the greatest horizontal glide distance with the least loss of altitude. If it is desired to restart the engines during the glide, consideration should be given to proper restart airspeed. A recommended glide airspeed of 260 KIAS and distance can be found in the flight manual.

Although the F-5A is a high-performance aircraft with a relatively low aspect ratio wing, the lift-over-drag maximum ratio of 9.2 to 1 with tip tanks only is comparable to that of other high-performance aircraft. What this means to the pilot is that the F-5A is capable of producing 9.2 pounds of lift for every pound of drag, or the F-5A is capable of

GLIDING FLIGHT



gliding with zero thrust 9.2 miles for each mile of altitude. However, the actual power-off glide performance that can be obtained with two windmilling engines is about 7.0 to 1 at 260 KIAS. This is due to the engine windmilling drag and the necessity to fly "off optimum" to satisfy the engine restart speed requirements. This is reflected in the flight manual as a glide ratio of 1.2 nautical miles for each 1000 feet of altitude.

Flying the maximum glide ratio of 7.3 to 1 (Fig. 1) would obtain the greatest horizontal glide distance with the least loss of altitude; not considering the engine restart requirements, maximum range glide speed is determined by the use of the equation:

$$V_{glide} = \sqrt{\frac{295 \quad (W/S)}{\sigma \quad C_{L_{glide}}}} \quad (KTAS)$$

where W is the aircraft weight and S is the reference wing area of 170 square feet. The factor σ is relative ambient density, which is available from the flight manual. Conversion to KIAS is made with the aid of data in the TO 1F-5A-1 appendix. A study of the F-5A hodograph or glide polar (Fig. 2) indicates the airspeed that produces the minimum glide angle, and the maximum horizontal glide distance is the airspeed that corresponds to the L/D_{max} angle of attack. This represents a glide angle of nearly 7° and an airspeed of about 232 KIAS at a gross weight of 11,000 pounds. However, the best glide speed is below the minimum engine airstart speed (250 KIAS) shown in the F-5A flight manual. Optimum engine airstart speed is 270 KIAS. The recommended 260 KIAS glide speed is a compromise between the minimum and the optimum airstart speed. If maximum glide distance is desired, the 232 IAS (tip tanks only) glide speed would have to be used.

The aircraft gross weight will have no effect on the glide distance since the glide ratio is based only on the relationship of the coefficient of lift-over-drag ratio of the aircraft. It is this L/D ratio that determines the distance an aircraft can glide. Any two airplanes of the same L/D_{max} values have the same glide ratios, regardless of their gross weight. However, an increase in gross weight will reduce the time to descend by virtue of the increased glide speed.

In comparing the gliding characteristics of an F-5A grossing 11,000 pounds with a lightweight 10,000-pound F-5A, the additional lift required by the heavier aircraft is not obtained by increasing the angle of attack, but by increasing the glide speed by approximately one knot for each 100 pounds of fuel remaining. The heavier aircraft has a faster glide airspeed and descends at a higher rate. However, the glide angle and horizontal glide distance will remain identical. Only the time the aircraft will glide varies; consequently, the heavier aircraft will use less fuel during a maximum range descent than the lighter aircraft if the engines are running. The best glide speed for tip tanks plus five pylons is 230 KIAS (weight = 11,000 pounds) which is two knots slower than tip tanks only. The additional drag of the pylons puts the F-5A at a higher lift coefficient (0.36 versus 0.35) which reduces the glide speed and the L/D (6.3 versus 7.3). Hence, the glide distance per thousand feet of altitude is 1.2 nautical miles for tip tanks and 1.0 nautical mile for tip tanks plus five pylons.

A no-wind power-off glide from 40,000 feet with an airspeed of 260 KIAS will cover a distance of 48 nautical miles in about 8.3 minutes. The rate of sink will be about 4900 feet per minute. Do not attempt t

fly a minimum rate of descent glide if distance is critical. Even though the rate of descent can be minimized by slowing to 205 KIAS, the glide angle is increased and the slower airspeed results in a decrease in horizontal glide distance of nearly 5.0 per cent.

The gliding performance is also affected by atmospheric winds, and the wind should be considered any time its velocity is a substantial percentage of the aircraft gliding airspeed. The airspeeds mentioned earlier, associated with various glide criteria, were for a no-wind condition. It should be noted that the airspeed should be increased with a headwind and decreased with a tailwind by two knots for every 10 knots of wind. This information is not included in the flight manual, since glide airspeed is rather insensitive to wind and the variation in glide range with wind is very small.

There is always a tendency to attempt to stretch a glide by increasing the angle of attack hoping to decrease the glide angle. A momentary decrease in the rate of descent is a misconception of stretching a glide. If the aircraft is gliding at its minimum glide angle and the angle of attack is increased by slowing down, the glide angle will increase, thereby decreasing the horizontal glide distance. This fact can be appreciated by studying Figure 2. It should be noted that an aircraft cannot glide at any angle shallower than its minimum angle of glide. There is another point to keep in mind: rolling into a gliding turn increases the rate of sink, due to the rapid increase in drag as more lift is developed during the bank.

The windmilling engine glide slope of 7° is double that to which you are accustomed during landing with power and is much more difficult to judge. A great amount of drag is quickly introduced during the low-speed flare maneuver, as the wing of a gliding high-performance aircraft does not decrease the rate of descent when the angle of attack is increased beyond that corresponding to minimum sink rate. It actually increases the rate of sink during the flare maneuver. Now add the probability of loss of hydraulic power to the flight controls during the flare, and you will understand the basic reasons why deadstick landings are not recommended in the F-5A aircraft.

The windmilling engine hydraulic output has proved adequate for power-off glides to restart altitudes or to an area for safe ejection but not sufficient for safe landings under other than ideal conditions. Four high-performance aircraft with similar hydraulic and flight control systems were deadstick landed at Edwards AFB by experienced test pilots under ideal conditions. Two were preplanned flight test evaluations and two were inadvertent. The low flight control response rates available from the windmilling engine-powered hydraulic systems and the rapid drainage of hydraulic power through use of the flight controls preclude safe deadstick landings in an operational environment. The flight crew should eject rather than attempt a deadstick landing.

If complete fuel exhaustion is imminent and a suitable landing field is within gliding distance, you may elect to declare an emergency; shut down one engine, reduce the other to idle before the fuel level reaches a minimum of 200 pounds remaining and establish an optimum glide toward a high key position. Restart the windmilling engine at high key, and complete a simulated single-engine pattern landing. Shutting down one engine and operating the remaining engine at idle as a precautionary measure will increase the glide distance by about 10 per cent as compared to both engines windmilling. An idling engine will consume about 40 pounds of fuel during a descent from 30,000 feet. Please keep in mind that during a minimum fuel situation, a moderate climb or dive may uncover the fuel boost pump inlets and cause the engine to flame out due to air entering the fuel lines. Flying a level or slightly nose high attitude will delay or prevent uncovering of the inlets and assure maximum utilization of the trapped fuel. Air entering the fuel lines during single-engine operation can only be purged by the engine-driven fuel pump. The fuel boost pump is ac driven and inoperative under this condition. The air must be purged in order to obtain a restart. There is another point to consider. If the pilot decides to shut down both engines, he must conserve the aircraft battery for restart ignition. Shutting down both engines also means the loss of all communications, navigation, and ac-powered equipment. However, fuel quantity may be monitored by using the static inverter ac power through use of the fuel and oxygen gage test quantity check switch.

You should also consider the accuracy of the fuel flow and fuel quantity indicators. The fuel flow indicator is supposed to be accurate to ± 50 pounds per hour; the fuel quantity indicator, to ± 25 pounds.

An insufficient fuel situation is an emergency condition and should always be treated as such. Deliberate preflight planning to extend the range of your aircraft through this system is in violation of AFM 60-16 and foolhardy. ★

(Northrop F-5 Service News)

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FOUR MINUTES

Friends, if you will give me approximately four minutes of your time, I will give you a few interesting facts about the birth and life of Tech Data. This isn't going to be a lecture, it's just a short item designed to give you a little better insight into the reason behind Tech Data.

When the manufacturers sell us a new airplane they sell us the books that help us keep it flying. They spend a lot of time and money thinking ahead to what kind of problems we can expect to run into and how to fix what goes wrong. All this thinking takes the final form of Tech Data. It doesn't stop here, that's only the beginning. Let's take the inspection work cards for example.

Now, those card items weren't put there just because some weenie behind a desk thought it would be a good idea for us to inspect something. Other than those items that have obvious safety of flight potential such as fuel leaks, the items listed in the cards were included only after thousands of your AFTO Forms 349 were made out and sent to AFLC for analysis. When the pre-determined number of forms has been submitted they finally get the idea that this particular Dohinky is breaking pretty often. Now, they figure the best way to keep a good Dohinky in each airplane is to inspect it often enough to detect a possible failure just before it happens. This is done by putting it in the cards.

This tells us three things: (1) The AFTO Forms 349 that you make out are very important because they, when added to all the rest, total many thousand from which a good analysis can be made; (2) Even though you have never seen this particular Dohinky go bad in all your experience, it is evident that some of them are going bad or they wouldn't have been put in the cards to begin with; (3) The cards mature along with the airplane. As the airplane gets older, we find more problems and the cards change to include the big ones.

But how about checklists? They just slow you down, right? Well, let's see. Take a Bomb Disposal troop; do you know how his checklist is written? Generally it is from the mistakes of others and in many cases those mistakes were fatal. When they disarm a bomb there is a man on headset communication with the guy who is risking his life. That is so the guy can tell him everything he is doing, and I mean EVERYTHING down to the smallest detail. Why? Because if something goes wrong, someone will know exactly where the mistake was made and he can spread the word to the other troops. Good thinking, right?

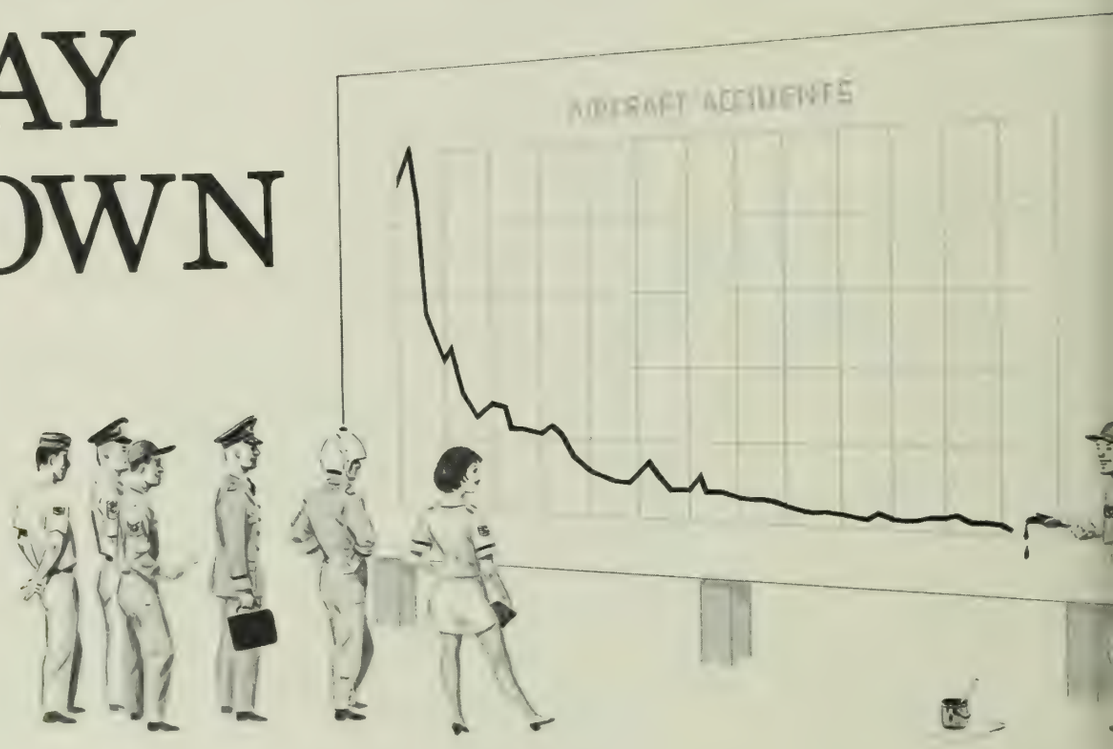
We have the same set up in aircraft maintenance. Our headset communication is the checklist. It was made with a lot of foresight and common sense and has changed for the better through the mistakes of the other guy. The danger is not as obvious as with the Bomb Disposal troop but it is still there. So, does the checklist really slow you down? Not if you're used to working with it DAILY. NOT using it could slow you PERMANENTLY. Don't be the cause of the next change to the checklist, unless you do it with an AFTO Form 22. That's a small piece of paper for you to use to show the Tech Order writers that they don't have all the smarts. If the checklist is wrong or confusing, you have a means of getting it changed.

But do I need a TO when I do a particular job every day and sometimes two or three times a day? Let me answer that question with a question. Why shouldn't you use it? Don't take it as an insult to your intelligence. Remember, the pilot who flies that airplane every day uses his checklist religiously and all he has to do is keep the damn thing straight and level. Look at it another way, EVERYONE all the way up to the Secretary of the Air Force is behind you when you go by the book, but you're all alone when you don't. Oh, you might get lots of sympathy from your best buddy, but that doesn't help much when you're in trouble.

Remember, the "book" is an accumulation of the ideas, experience, and mistakes of every man in maintenance. We made the book through our AFTO Forms 349, AFTO Forms 22, and unfortunately, our mistakes. Why should you go by the book? Because YOU wrote it, YOU changed it and updated it, and YOU can really be proud of the work YOU have done. ★

WORKING OUR WAY DOWN

Anchard F. Zeller, PhD, Directorate of Aerospace Safety



The Air Force in 1970 set a safety record that is going to be a hard act to follow. Hardware savings alone were impressive, but more important was the remarkable decrease in lives lost. There were 75 fatal accidents in the year just past, in contrast with 116 in 1969 and 110 in 1960. The marked decrease in 1970 would suggest that a new downward trend may have been initiated, or at least that a lower pleateau may be anticipated.

Pilot fatalities reflect this same improvement. In 1969 there were 389 fatalities in aircraft accidents, including 139 pilots. It is disturbing to note that as far back as 1960 there were 275 fatalities, 125 of which were pilots. These figures emphasize the relatively static nature of the accident record in the 10 years prior to 1970. They also serve to emphasize the remarkable record obtained in 1970, when there were 92 pilot fatalities, the lowest number recorded in a single year in the history of the Air Force as a separate service. Through the first 11 months of 1970, an equally impressive record obtained in the total number of lives lost in Air Force aircraft. This changed suddenly with two accidents which added 123 fatalities. Such occurrences emphasize the rapidity with which good records can dissolve and the need for constant vigilance.

Note that the discussion has bee couched in terms of numbers rathe than rates. The rate pattern is com parable, but it is numbers whic more vividly express the real magni tude of the problem and which em phasize clearly how far removed good record is from a perfect record

How gratifying it would be, if w could assume that the 1970 recor was actually the initiation of anoth er major downward trend and tha the 1971 record would result i equally impressive gains. Before a riving at such an optimistic, rose colored conclusion, however, a attempt should be made to examin not only the numerical trends, bu also some of the other variable

which may have been associated with the 1970 experience and which may have equal but different results in 1971.

I am sure all of you are acquainted with trend analysis as applied to everything from business statistics and stock market analysis to accident statistics.

There are several approaches, but regardless of the method used, there is always one basic problem: the findings are presented in terms of overall pictures and patterns, and seldom attempt to predict the outcome for an individual in a specific instance.

Predicting individual performance, however, is highly desirable because it is individuals who have accidents, it is individuals who destroy aircraft, it is individuals who are killed. Although the 1970 statistics reflect a desirable trend in the number of accidents directly attributable to, for example, the pilot operator, collectively, human failure is still the most frequent cause factor in accidents and is increasing in relative importance. It would seem, therefore, that the most profitable area for exploration would be in evaluating the role which the individual has played in past accidents as well as projecting the kinds of human pressures which can be anticipated in the future. From the integration of these methods, some reasonable projection can be made of accidents as they will occur in 1971—with perhaps some indication of the kinds of individuals and accidents which will require particular attention.

Although hardware is not the specific area under discussion, the hardware problems of 1971 will no doubt resemble those of 1970. No new aircraft will be introduced. The usual problems that come with new aircraft designs have already been experienced with the F-111 and C-5. It would appear that there should be no aggravation of these problems within the next year, and presumably, with the passage of time, the problems which have been identified will be corrected. On the other hand, there are aging airframes, but none which have demonstrated a pattern of deterioration capable of producing a rash of materiel failures.

In the human areas, however, there are important changes. We know, for example, that the first hours of operational flying are the most hazardous in a pilot's life. In the past we have attempted to reduce this high accident potential by modifying and increasing training hours. However, a program is now under way to decrease the number of hours allocated to primary pilot training from 240 to 208 or, in some instances, to 188. The Air Training Command has embarked upon this program in a systematic, carefully controlled way with the conviction that the resultant product will be as capable as were pilots in the past who were given more hours of training. Time will tell. Certainly the relation between experience and accidents is well documented. When more pilots with less training come into the system, the effect on the accident record could be quite deleterious. In this regard, USAF planners project that the majority of pilots in the Air Force five years from now are either presently in training or will have been trained during that period.

This implies a requirement for improved supervision. While individuals may be trained to fly in fewer hours, their limited experience in the Air Force system will place a heavier requirement upon supervisors to assure that these neophyte airmen are used to best advantage.

Past experience, including 1970, indicates that in the history of flying there has been little change in human limitations. Many of the problems of the past can be expected to remain in 1971. Although accidents were reduced, in both number and rate, in 1970, and although accidents attributed primarily to pilot error were also reduced in number, the trend for a greater proportion of accidents to be attributed to overall human error continues. Collectively, accidents attributable to human error remain the biggest single factor in losses sustained. Pilots commit errors because of preoccupation with other duties, inadequate understanding of the aircraft systems, calculated risks that were not calculated at all, inadequate knowledge of emergency procedures, inadequate knowledge of survival equipment, and the inability to make up their minds as to a course of action. Infrequent, but still present year in and year out, are violations which, while so hard to understand, still occur. Crew station design misconceptions continue to place excessive demands on pilots. Maintenance personnel continue to omit, misalign, inappropriately torque equipment and perform faulty service such as filling reciprocating aircraft with jet fuel.

It is no secret that within the past several years there has been growing public concern over our involvement in Southeast Asia. Questions have been raised not only by liberal students, but also by many respected members of the Congress and other concerned citizens. This increased questioning is, in turn, a reflection of a major social revolution which is taking place in the cultural group from which the members of the armed forces are drawn. The proportion of younger people in our

population is rapidly increasing, and the technical age in which this group has been reared has focused their attention upon new problems, resulting in a cultural outlook different from that of their elders. It is necessary to realize that young military members are a reflection of the culture from which they are drawn.

In popular wars of the past, recruiting offices were swamped with volunteers ready to preserve their ideologies and save their countries. Today, non-rated quotas are largely filled either by the draft or fear of it, and the number of individuals actively engaged in resisting this is only another indication of the change in cultural outlook. When national pride and national protection are at stake, the soldier is a symbol of all that is good, heroic, and patriotic. When an unpopular (and, in the minds of many, meaningless) conflict is under way, the soldier becomes the object of censure, not praise. It is only natural that the individuals who are part of the armed forces feel this pressure. For the young person who already questions older values, whose sympathies are basically with his civilian counterparts, who was forced into the service against his will (or volunteered to keep from being forced into something he considers worse), it is difficult to maintain an esprit de corps.

When some campuses are discontinuing or actively considering discontinuing ROTC programs, when academic credit for ROTC programs is withdrawn, and when ROTC graduations cannot be conducted without fear of an open demonstration, it is not surprising that many young men have doubts about their choice when they embark upon a military career. Not only does this background censure affect the young; it also affects their elders. A man who has given the greater part of the best productive years of his life to a service of which he is proud, and who has been engaged for the latter part of this service in what is the culmination of any military service, active combat, feels that he deserves the acceptance of his fellow countrymen if not their applause. When he finds that he is not universally admired, but may actually be censured in some circles, it is quite natural that he begin to experience some doubts about his own value system.

Some philosophically oriented professional military men can remember times of feast and times of famine, in terms of public approval. For them, the current phase is merely one to be lived through and one which will undoubtedly be replaced by happier times. For every one of these, however, there are many who feel only the censure. So we arrive at the simple question: What is the worth of a soldier—both in the minds of those whom he represents and in his own mind? Regardless of the answer at which each arrives, the very fact that the problem is presented, so that it needs consideration, is in itself a detriment to safe accomplishment of precision operations.

This brings us to the heart of the matter. What actions in 1971 can result in a continuation of the fine safety record established in 1970?

New times, new missions, new requirements, new hardware, all require modifications in operational aproach and a consequent shift in safety programs. Without abandoning the other time-honored management tools, greater emphasis must be place upon individual attitudes and motivations if improved safety records are to be achieved. That the climate in which the military systems operate has undergone modification is obvious. The wise commander and his safety specialists will modify their approach to accident prevention to reflect these changes. It should be noted, however, that the very changes which require consideration also affect those who must give them consideration. This paradoxical situation means that the individual must not only recognize the symptoms reflecting a need for change but must also be able to maintain a detached viewpoint so that he can counteract the problems within himself.

These changes will not only affect aircrews, but maintenance personnel, armament crews, other support personnel, managers, directors, and safety officers as well. Fortunately, one of the major advantages which the human has over other creatures is that he is able to benefit from rational analysis. We must be aware that the changes taking place will have a significant effect on safety. With this awareness and analysis of the implications, added emphasis can be placed upon professional operation and self-discipline. Moreover, added efforts must be made to assure that standard procedures and technical orders are followed, that individuals are encouraged—even forced—to accomplish assigned tasks in an optimum manner. Those responsible for assuring that this is done must be constantly alert to the dangers of complacency, anxiety, diminished feeling of worth, and all of the other emotional attitudes associated with the discontinuance of a once highly viable and ego-satisfying project. If this is done, the dire predictions for the future can perhaps be obviated. If this is not done, the expected will probably happen and safety will suffer. ★

THE I.P.I.S. APPROACH

By the USAF Instrument Pilot Instructor School, (ATC) Randolph AFB, Texas



AREA NAVIGATION

Q What is area navigation?

A Area navigation (RNAV) is a method of navigation that permits aircraft operations on any desired course within the coverage of station-referenced navigation signals (such as VOR/DME, TACAN) or within the limits of self-contained navigation system capabilities independent of ground facilities.

Q What are some of the major advantages of area navigation?

A There are four principle operational features which offer many advantages to users equipped with area navigation equipment: (1) direct flight (or nearly so) from point of departure to destination; (2) flight in terminal areas to allow arrivals and departures over multiple prescribed flight paths; (3) instrument approaches within certain limits of accuracy to airports with no local landing aids; and (4) vertical climb and descent guidance while enroute and for making approaches. Depending on the system, positive course guidance is displayed to the pilot in one of three methods: (1) symbolically such as on the course deviation indicator and bearing pointer; (2) pictorially on a map display; and (3) as a digital readout display.

Q Do any Air Force aircraft have area navigation capability?

A Several Air Force aircraft have inertial navigation systems with area navigation potential. However, according to the Federal Aviation Administration, no Air Force aircraft has been certified by them for area navigation. Furthermore, no Air Force aircraft has been equipped with the area navigation equipment that is now available to civil aviation. If you desire more information, the IPIS has published "Summary of Area Navigation Systems and Proposed Usage in the U. S. Airspace System," which is yours for the asking.

RECOMMENDED ALTITUDE

Q Most high altitude approach procedures depict a recommended altitude at the initial approach fix (IAF). If cleared for an approach which has a recommended altitude at the IAF, do I have to cross the IAF at this altitude or could I descend prior to the IAF?

A In discussing this with FAA we find that normally ATC controllers expect you to cross the IAF at or above the recommended altitude. The IPIS recommends the depicted altitude be the minimum altitude crossing the IAF unless a lower altitude is assigned by ATC.

OFFSET ILS

Q I've noticed several offset ILS depictions in both high and low altitude instrument approach procedures, e.g., Carswell AFB. Are offset ILS's correct and how much turn will I have to make at decision height (DH) in order to align myself with the runway? Additionally, are minimums higher for an offset ILS?

A Where a unique operational requirement indicates a need for an offset course, it may be approved provided the course intersects the runway centerline at a point 1100 to 1200 feet *toward* the runway threshold from the DH point on the glide slope and the *angular divergence of the course does not exceed three (3) degrees.* The minimums are not affected.

POINTS TO PONDER

AFM 51-37, page 11-14, states that the *initial* outbound leg for holding shall be flown *for* the appropriate time depending upon altitude. FLIP states that the first outbound leg after *initial* holding fix passage *will not exceed* one minute at or below 14,000 feet and one and one-half minutes above 14,000 feet. The *revised* AFM 51-37 has been changed to correspond with FLIP. ★



REX RILEY'S CROSS COUNTRY NOTES

REX'S COMMENTS

These two letters from our troops in the field reflect the sub-standard performance by some transient facilities. Letters such as these highlight a particular base and it is put on "Consider for Elimination" if we have other derogatory comments. We hope you fellows who encounter such problems will let us know—we'll take action if the evidence indicates a poor transient facility.

Dear Rex

In our modern aerospace force, the day of the "propeller" aviator seems to be drawing to a close. We are receiving some unwanted assistance in this direction from unusual areas. Let me relate a recent experience to you in hopes that it may stimulate an article or even some follow-up checking by you on the subject.

On the 8th and 9th of December, I made scheduled stops at AFB in my trusty T-29. On 8 December I could hardly believe my eyes when the fuel truck drove up with "JP-4" painted all over it. That set the stage for the hour and a half servicing stop. The truck driver stated that he was told it (my bird) was a T-39. I shudder to think what might have happened if it had been dark and my flight engineer had not been alert. Next came the oil gambit. I was told that SAC had taken their oil trucks out of service since they were no longer needed. The oil was delivered in five-gallon cans. Transient Alert men did not stay to help the engineer pour the oil and hold the funnel. I had to help him with this when I returned from Base Operations. Next I tried to find a power unit. I couldn't even find anyone on the ramp from Transient Services. Since the Code 7 I had on board was getting hot on the ramp, I went to the Base Operations Officer for assistance. He was nowhere to be found and the dispatcher didn't know where he was. I then walked over to the Transient Services building and found four men drinking coffee and smoking. I, not too respectfully, requested a power unit as a personal favor and was finally launched by a grumpy civilian.

Being a little wiser from my first experience, I stopped again at the "Friendly Air Patch" and was subjected to another Chinese Fire Drill on 9 December. For a base that has no further need for an oil truck I was surprised at the "recip" activity. There were a C-118, a C-119, a C-124, and three T-29s on the ramp. This time I managed to get fuel OK, but the oil gambit came back to haunt me. Again oil was delivered to me in five-gallon cans and you won't believe the funnel! They could not find the funnel I had used on the 8th. (I didn't have it.) The only substitute item was a cone-shaped rubber road construction marker with the end cut off. Then I went looking for a power unit again. The crew of the C-118, both colonels, said they had been

waiting for a fire guard for nearly an hour. So after dispatching my navigator in search of a power unit, the engineer and I went over and removed the ramp from the rear service door, stood fire guard, and walked the C-118 out of the parking area. Finally I received the necessary support, jumped into my bird and disappeared into the east (never to return again, I hope).

I'm afraid that ____ is one base looking for an accident to happen. I sincerely hope that you can help the fading recip jocks from becoming extinct before their appointed time. We really want to keep 'em flying, especially with the crowd we normally have on board. Maybe the next time you feel a trip coming on, you'll grab a T-29 and a funnel and try out a few spots.

One last question. Has anyone ever toyed with the idea of putting a different grounding plug and receptacle on recips and AVGAS trucks? That way you could not properly ground a JP-4 truck to a prop bird, even in the dark. It wouldn't be foolproof, but it would make it harder on "Murphy."

Thank you for all the good work in the past, and I wish you a happy and safe 1971.

An Unhappy Traveler

Dear Rex

On 4 Dec 70 I arrived at ____ AFB at 1930 local in an A-7D. Approach aids, runway lighting, etc., were excellent and I was promptly met by a Follow Me truck and marked. I deplaned, personally bled my accumulators, checked the oil, and filled out the T.A. debrief sheet requesting only JP-4. No special maintenance other than a normal preflight for a 1000 hours departure the next day.

Transportation was available to an excellent BOQ. Excellent dining facilities were available at the Club. Breakfast the next morning at the flight line snack bar was excellent.

I changed my departure time to 1140 local and arrived at Base Operations at 1000 for flight planning. Weather briefing and flight planning facilities were excellent. After completing flight preparation, I handed my DD-175 to the dispatcher who said T.A. would be notified of my departure. He said they were busy and that there might be some delay but to catch a crew bus to my aircraft (one half mile from Operations) and "grab" a T.A. truck, which should be on the line.

After waiting approximately 12 minutes for transportation, I was driven to my aircraft. I got off the bus, huddled under the wing of my A-7D (temperature 35° and rain) to await T.A. They didn't show! After 30 minutes of this I, along with two other officers in an F-4D who suffered the same fate, walked back (one half mile) to Operations in the rain.

All the operations personnel thought our plight was extremely humorous. The A.O. was as helpful as he could be, but his effectiveness was limited by the attitude and capabilities of T.A.

When I finally departed, one hour and 30 minutes late, I was also cold, wet, and disappointed in the continuing decline of proper military operations in the USAF.

As a bit of additional information, I would like to add that my aircraft forms were not complete, the aircraft was not preflighted (neither was the F-4), and at least part of the T.A. crew was in the snack bar after we walked in from the flight line.

I am writing this letter not so much as a complaint but as a documentation in the hopes that similar situations at ____ can be prevented in the future. I honestly feel it is a valid Flying Safety hazard to start a flight under these conditions.

An A-7D Pilot ★



REX RILEY
Transient Services Award

LORING AFB	Limestone, Me.
McCLELLAN AFB	Sacramento, Calif.
MAXWELL AFB	Montgomery, Ala.
HAMILTON AFB	Ignacio, Calif.
SCOTT AFB	Belleville, Ill.
RAMEY AFB	Puerto Rico
McCHORD AFB	Tacoma, Wash.
MYRTLE BEACH AFB	Myrtle Beach, S.C.
EGLIN AFB	Valparaiso, Fla.
FORBES AFB	Topeka, Kans.
MATHER AFB	Sacramento, Calif.
LAJES FIELD	Azores
SHEPPARD AFB	Wichita Falls, Tex.
MARCH AFB	Riverside, Calif.
GRISSOM AFB	Peru, Ind.
PERRIN AFB	Sherman, Tex.
CANNON AFB	Clovis, N.M.
LUKE AFB	Phoenix, Ariz.
RANDOLPH AFB	San Antonio, Tex.
ROBINS AFB	Warner Robins, Ga.
TINKER AFB	Oklahoma City, Okla.
HILL AFB	Ogden, Utah
YOKOTA AB	Japan
SEYMOUR JOHNSON AFB	Goldsboro, N.C.
ENGLAND AFB	Alexandria, La.
MISAWA AB	Japan
KADENA AB	Okinawa
ELMENDORF AFB	Alaska
PETERSON FIELD	Colorado Springs, Colo.
RAMSTEIN AB	Germany
SHAW AFB	Sumter, S.C.
LITTLE ROCK AFB	Jacksonville, Ark.
TORREJON AB	Spain
TYNDALL AFB	Panama City, Fla.
OFFUTT AFB	Omaha, Nebr.
ITAZUKE AB	Japan
McCONNELL AFB	Wichita, Kans.
NORTON AFB	San Bernardino, Calif.
BARKSDALE AFB	Shreveport, La.
HOMESTEAD AFB	Homestead, Fla.
CHANUTE AFB	Rantoul, Ill.
KIRTLAND AFB	Albuquerque, N.M.

OPS topics

OOPS AND . . .

A CH-3 student was practicing a simulated single engine, minimum roll landing. On short final, the rotor rpm was dropped to 96 percent. The instructor pilot called this to the student's attention while simultaneously advancing the speed selector on the simulated failed engine and blocking the collective pitch to prevent further increase until rotor rpm was regained. The helicopter touched down 50 feet short of the pad but became airborne again as the engine accelerated. A landing was made on the pad; engines shut down, and the aircraft inspected. It was discovered that the tail had dragged and the intermediate gear box fairing was damaged.

Later the same day another CH-3 student was making an auxiliary servo-off approach. The final approach speed was slightly high, and at the last minute the student flared abruptly to slow the aircraft. The instructor pilot assumed control but his action was too late to prevent the tail from striking the ground. Again the intermediate gear box fairing sustained damage.

OOPS AGAIN!

Maj Gerald A. Jones
Directorate of Aerospace Safety



CONTROLLERS CITED

Air Force Communications Service controllers were credited with 85 "saves" during 1970. Of the total, 67 were military and 18 civilian aircraft with 170 crewmembers and passengers aboard.

A "save" is defined as "the safe recovery of an imperiled aircraft through extraordinary and timely application of air traffic control knowledge, techniques and procedures where there is reasonable doubt that the aircraft could have been recovered without such action."

Our AFCS controllers continue to be one of the pilots' best friends. Well Done!

LAISSEZ FAIRE SUPERVISION

Occasionally, an accident report will reveal tha supervision within a flying unit is far from uniform Interest tends to focus on the primary mission, some times at the expense of the support mission. Supervisor must be alert for the kinds of complacency revealed i this extract from an investigation of a T-33 landin accident:

Board Member: "In your opinion what have w learned from this accident?"

Officer-in-Charge of T-33 Training: "Well, I thin in a lot of accidents you learn maybe that you're to complacent in places and assume too much about wha people ought to know and I have also learned that greater effort has to be made or emphasized by th bosses to make time available for flying [the T-33] fo training as well as [on target missions]. I think peopl don't have bull sessions about flying the T-bird any more but they do about the [interceptor.]"

This supervisor's training program had consisted o periodically handing out some reading matter.

When was the last time you, the commander, took cold, hard look at the training program of you unit's support aircraft? And at your intermediate leve supervisors?

Maj David H. Hook, Canadian Forces
Directorate of Aerospace Safety

DELAYED STOPOVER?

Ever been on an IFR stopover flight and had to coo it on the ground waiting for departure clearance? And then been told that Center didn't even have your flight plan? It happens every day to someone, but it's prob ably because he didn't comply with paragraph 3-3, AFR 60-16. Here's the way the system is supposed to work: Your flight plan goes to each stopover tie-in flight service station. They hold it (as advertised) until they receive your ETD. Then they call it in to Center and presto! No problem.

Next time you start to steam while waiting for clearance for your *NOW* ETD, remember that it takes a while for the word to go through channels to Center and back to you.

The solution is really simple: Next time, as you approach your stopover point, call the tie-in FSS listed in the FLIP IFR Supplement on 255.4 Mhz and give them your ETD. Your clearance will be ready when you are.

(Salt Lake City FSS)

FLIP CHANGES

Effective with the 4 February 1971 issue of the US Enroute Low Altitude Charts, Chart L-23 was expanded Northward to provide a better presentation of the Muskegon-Detroit area. Also two new Area Charts were added to Chart A-1/2. These charts provide improved presentations of the Washington D.C. and the Denver-Colorado Springs areas which had previously been shown on various charts with different scales.

Autovon and commercial telephone numbers are no longer published in the Aerodrome Remarks sections of the US IFR and VFR Supplements.

ANYTHING ELSE, CHIEF?

Controller: "Air Force 123, say altitude."

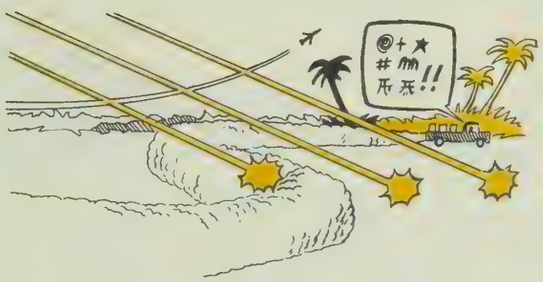
Pilot: "Altitude."

Controller: "Air Force 123, say altitude, please."

Pilot: "Altitude."

Controller: "Air Force 123, say IFR cancelled."

Pilot: "Air Force 123 passing 14 thousand."



BAD TRADE

There are darned few instances of an airplane coming out on top in a contest with a tree, and the pilot of an A-37 recently proved the point. The target was the north end of a truck headed south, on an open road through jungle with foliage up to 150 feet high. The target was "hot" and the pilot rolled in with an intentional overshoot, planning a double jink on final to avoid the ground fire on his low-angle napalm pass. His problems were complicated by a late clearance from the FAC, providing a momentary distraction while he armed his ordnance. Pulling off target, he took out pieces of jungle with his right wingtip and both external fuel tanks. A controllability check at altitude provided some more bad news, so the pilot made a controlled ejection and was picked up in short order by a chopper. That's a relatively happy ending, but there's one bird that won't hit any more trucks. Pressing to improve accuracy is usually a bad bet—and a truck for a fighter aircraft is a really bad trade. Besides—he missed the truck.

ANOTHER FORM OF FOD

The F-4 pilot was on an upgrading mission, with an instructor in the back seat. They had just begun evasive practice maneuvers, involving slight negative G pushovers followed by positive G pulls when the aft canopy initiator fired. Best guess is that the IFR Supplement drifted out of its case during negative G and wedged between the guillotine hose and the aft canopy initiator linkage, then applied sufficient force to the linkage during positive G to fire the initiator. Grey paint on the Supplement matched missing paint from the initiator linkage arm. The IP bought this one—but in his defense, the back seat book box in the F-4 just isn't big enough to hold all the stuff we have to carry. Local mod design to provide more storage space was already underway when this accident occurred. Other units would do well to examine their own cockpit security, and if a storage problem presents similar hazards, submit their suggestions to the major command for approval.



We don't know if anyone ever said it in just these words, but every pilot knows the value of air beneath him and runway ahead of him. Some, however, must not have got the whole message because from 1965 through 1970, 121 of our birds struck trees, poles or wires while flying close to the ground. Trees were the favorite target, followed by wires and a couple of poles. Oh, yes, there was one tower and that was bad news; it cost us an airplane.

Our aircraft are pretty well put together, or we're lucky, because nearly two-thirds received less than minor damage. Eighteen were dented to the extent that they were classified as minor damage, 10 were substantially damaged (that means they were pretty well beat up) and 20 were destroyed.

Fighters (for convenience we included recce versions, the T-33, T-37, T-38 and A-1 in this category) accounted for more than half with helicopters adding 22 to the total. Thirteen small aircraft, O-1, U-10, etc., got into the act, seven C-130s were involved, a B-57 and even a T-29.

Most of these collisions occurred during weapons deliveries, but don't jump to the conclusion that our troops in SEA were the culprits for pressing too much. Only 34 took place in combat weapons deliveries.

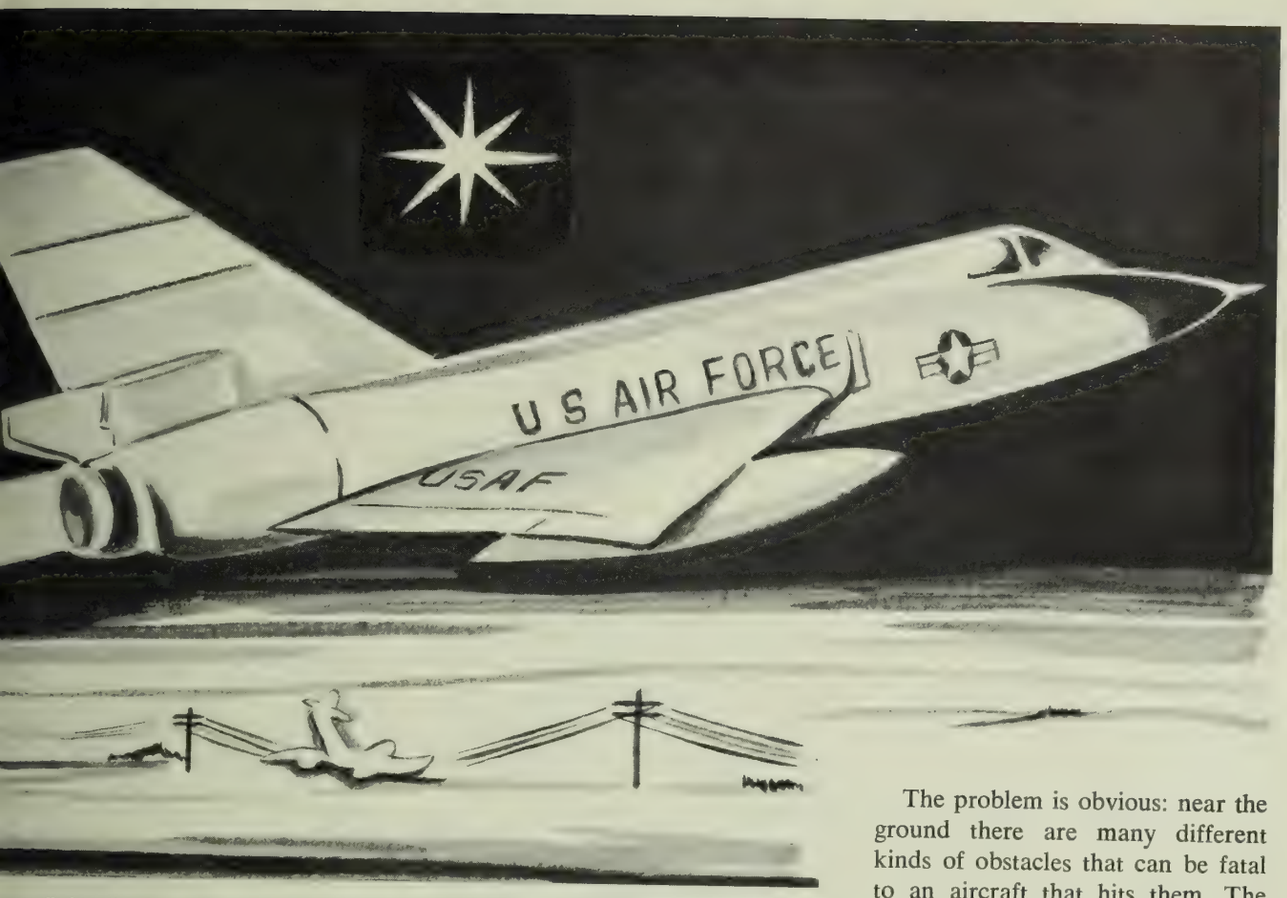
There's one thing managers, include safety types, like to get their teeth into and that is finite figures on past performance. For example, they like to think, well, we have had 15 of those a year for the past five years, so we'll go after the problem and shoot for a reduction of, say, five. That's 33 percent less, pretty good performance guaranteed to get one at least a pat on the back, possibly a commendation, and it won't hurt at ER time.

There's nothing wrong with such thinking; the record shows that we have been fairly consistent and can stand some improvement. Th record reads like this: 1965—20 1966—28, 1967—13, 1968—23 1969—24, 1970—13.

A review of the past leads to th prediction that there will be perhap a dozen or more collisions wit trees, wires or other obstacles durin 1971. However, if we really concen trate on avoiding this kind of mis hap we undoubtedly could ge through the year with none. To giv an idea of what to look for, here' a brief rundown on some of the lo level collisions that resulted in fa talities and destroyed or substantial ly damaged aircraft.

In 1965 an HH-43 flying in a canyon hit wires and crashed, kill ing the crew. Last year another HH 43 flying above a river hit powe lines the pilot didn't see and crashed into the river. The crew was only shaken up but a passenger was severely injured.

Six aircraft were destroyed in 1966. In one case a pilot of a T-38



vas flying local to reduce fuel and it a tower. The collision ripped off nost of a wing, forcing the pilot to eject. He made it okay. In the other ne the pilot of a U-10 swerved to niss some birds shortly after takeoff nd hit a stump sticking up 30 feet. he pilot received only minor in- uries but the aircraft was destroyed. An O-1 crashed and the pilot was everely injured when the aircraft hit tree. A helicopter flew into a pow- r line and all aboard were killed. There were three bad ones in 968. An aircraft on a low level avigation training mission hit pow- r lines that were not marked on the ilot's map and went into a lake. here were two fatalities in that one. hen an F-102 was substantially amaged when the pilot saw some eople he knew on a golf course ear the base, made a low pass and it a utility pole. An F-100 also re- eived substantial damage when the ader of a three-ship flight hit guy ires supporting a 1034-foot tower.

The Air Force lost five aircraft and two pilots in 1969, one a helicopter that hit static wires 27 feet above a high voltage power line and the other an A-37 that hit a tree during a low angle pass while attacking trucks in SEA. That pilot successfully ejected but the chopper pilots were killed. Also that year an RF-84 was seriously damaged when the pilot, flying a low level photo recce mission, hit a tree about 90′ AGL.

Last year things improved but two birds were destroyed, an HH-43 and an F-100. A T-33 received substantial damage. The T-bird was on a test flight to determine the accuracy of a new altimeter at low altitude and high speed. Unfortunately, the pilot was flying into the setting sun and didn't see some power lines 50 feet above the ground and hit same. Mark up a damaged T-bird and a lucky pilot—he was able to fly it back and land safely.

The problem is obvious: near the ground there are many different kinds of obstacles that can be fatal to an aircraft that hits them. The solution is equally obvious: Don't fly in the vicinity of these obstacles. There's not much excuse for hitting these things anyway. There is seldom any reason for flying so low that obstacles 30-50-100 feet AGL are a menace. In those areas where very low operations are conducted, all obstacles must be catalogued and annotated on pilots' maps.

Pilots should understand that any canyon may have wires strung across it. Flying through a canyon may be thrilling, but not half so thrilling as hitting a three-inch cable and staring death in the face. Remember this: Above lines carrying high voltage are smaller wires, for grounding, that are harder to see.

As for low level weapons deliveries, the urge to hit the target, the drive to excel are understandable, but there is seldom, if ever, any requirement to go so low that the aircraft can't be recovered without taking leaves and branches with it. ★

TECH

briefs for maintenance techs

TOPICS

do it right the first time



It only took two manhours to install the clamp. No damage had been done. However, it doesn't take much imagination to realize the potential danger described in the following incident.

The IP in a T-38 at FL 300 noted the left engine EGT to be only 550 degrees C. The throttle setting was mil power, rpm 100 per cent, fuel flow 1200 pph, so a decision was made to put the bird back on the ground. While on a straight-in approach for landing, the IP attempted to make a throttle adjustment, but the left engine remained at 89 per cent with the throttle in the idle position. The fuel shutoff switch was used to shut down the left engine in the flare and a successful landing was accomplished without further incident.

Maintenance found the push-pull throttle control assembly had become separated from the throttle flexible control support clamp, which had not been properly installed. Only two manhours to reinstall the clamp, true; but the whole incident should never have happened. Right?

jammed controls



Few things frighten a pilot more than the thought of finding his controls jammed at an awkward moment. We were lucky on this one, but it's not hard to imagine the possibilities.

An F-4E crew was on a day gunnery range mission in the sunny southland. On his third dive bomb pass, the pilot discovered that the control stick would not move right of center. He recovered to level flight and headed for home, performing a controllability check en route. Now the stick moved freely in all directions! No further problems were encountered until the landing roll when once more the stick would not move to the right.

Inspection disclosed a ⅜ inch hex-head steel bolt lying loose in the rear cockpit stick well, and the malfunction was duplicated by placing the bolt between the stick and the torque tube. Marks on the bolt indicated that it had been lodged in this position.

Suppose, just for a moment, that the bolt had lodged so as to have restricted *aft* movement of the stick. The pull-up after bomb release is *not* the time for that kind of a problem. We can all thank our lucky stars that nobody had to pay with his life for someone else's thoughtlessness—not this time, anyway.

proper procedures could prevent dropsy

The following incident makes one wonder just how often work is performed in such a haphazard manner. If you follow the sequence of events, it's not hard to reach the conclusion that this procedure had been followed before. Otherwise, why didn't someone along the way stop it before it became an incident?

An F-100 returned from a combat mission, with a writeup in the 781—dim light on gear handle inoperative. An electrician was dispatched to trouble shoot and repair the discrepancy. Unable to find anything wrong with the landing gear panel while it was installed in the aircraft, he removed the panel for in-shop bench check and repair and made the following entry in the 781-A, "Landing gear panel removed for repair." Symbol used was a red diagonal. At the electrical shop he turned the panel over to a second electrician who checked it, found it serviceable, and returned it to the aircraft where he connected it electrically.

After further trouble shooting he decided that the dimmer relay located under the floor boards would have to be checked. He was able to get one of the floor boards up, but the second one had screws in it that he was unable to remove. About this time a weapons loading crew arrived, so the electrician, not wanting to stand in the way of progress, turned the ship over to the loading crew who proceeded to upload six each MK 82LD bombs and install all ejector cartridges. They also notified job control that the aircraft was loaded HOT.

The crew chief then removed the stubborn screws from the floor board so the electrician could get back in and R&R the dim control box. A functional check proved the landing gear lights to be operational. The electrician then proceeded to reinstall the landing gear control panel. He had the bottom two screws installed and was attempting to install the upper left screw. Then, while the flightline supervisor was standing on the aircraft ladder checking on the electrician's progress, the electrician inadvertently pushed the emergency jettison system. The wings were cleared of two TERs, two Type I pylons, two Type III pylons, and two 335 gallon fuel tanks.

Investigation did not reveal any problems with the emergency jettison system. All pylon safety pins including tank pins were installed.

This incident raises a few questions:

- Why did job control allow the aircraft to be loaded before it was in commission?
- Shouldn't the removal of the landing gear panel for in-shop bench check and repair call for a red cross?
- Would this unit still be operating the same way if this incident hadn't occurred?
- How many other units throughout the Air Force are following similar procedures, just waiting for an incident or accident to happen?

don't depend on luck



The F-100 mission had progressed quite normally until, during a turn, the pilot discovered he could not push the right rudder pedal past neutral. After reducing his fuel load he made a successful approach end barrier engagement.

Investigators found two screws missing from the left console panel adjacent to the left rudder pedal. This allowed the panel to protrude several inches and block the aft movement of the left rudder pedal past the neutral position. If this could happen in the neutral position it's not hard to visualize the same thing happening at any position within the travel range of the rudder pedals. Luck prevailed in this case, but there is no room in aircraft maintenance for luck.

TECH TOPICS

briefs for maintenance techs



a gremlin in a C-7

The pilot of a C-7, while performing the before-landing checklist, noted the left main gear failed to indicate down and locked. Observation revealed the left main gear to be in the intermediate position. Emergency procedures were attempted, but the gear remained in the intermediate position. Following the Dash One, the pilot lowered the nose wheel and retracted the right main, in preparation for a wheels up landing. Twenty-five hundred feet of the runway was foamed, and the pilot set the aircraft down in the first few feet of foam. It slid to a stop approximately 30 feet beyond the foam. Damage was considered minor. The problem: a piece of metal cotter key was left in the shock strut housing by person or persons unknown.

smell, yes-seep, no

Shortly after takeoff the load master of a C-141 detected strong fumes in the cabin. The aircraft commander directed all crewmembers and the one passenger to go on oxygen. The scanner isolated the source of the fumes—pallet position six. No spillage was apparent so the aircraft commander elected to depressurize the aircraft. A precautionary landing was made without further incident. Approximately 15 minutes after landing the loadmaster and scanner reported they felt nauseous and had headaches. They were sent to the hospital for examination. After the suspect cargo was removed from the aircraft and impounded, the fumes were found to be coming from deteriorated containers of methyl ethyl keotone. The containers were rusted at the seams; however, fluid was not seeping out. It was apparent that fumes would emanate as the pressure changed inside the aircraft with the increase in altitude.

F-4 egress system

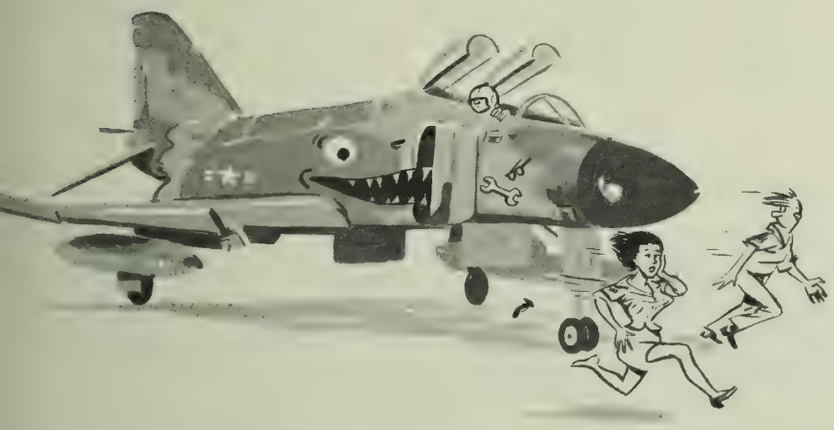
Judging from the number of accidents and incidents involving the F-4 ejection system, it's imperative that maintenance and flight crews take a real close look at their procedures, and that only fully qualified personnel be allowed near the cockpit.

Two recent incidents occurred while the crew chief was attempting to assist a member of the flight crew. In one the navigator was seated and strapped in the aircraft when he discovered the map case on his left was open and that he could not close the zipper. He asked the crew chief to reach in and close the zipper for him. All safety pins except the face curtain and banana link pins had already been removed. The canopy was fully extended. The crew chief attempted to close the zipper with his left hand only but was unable to do so with one hand. So, in the process of putting his right hand in to steady the bag, the sleeve of his parka caught on the canopy initiator linkage forcing it downward and actuating the initiator. Damage was somewhere around $325.00 for equipment and manhours.

The second incident, only a few days later but in a different part of the world, reads almost identically. The only difference was that the crew chief in the second case was trying to unfasten the map case to place seat pins in it. He also inadvertently activated the canopy initiator.

A third mishap with a different set of circumstances produced the same results. In this one the seats were removed in preparation for phase inspection. The airman was entering the cockpit to inspect the cockpit and canopy. He had placed his left foot inside and was bringing his right foot in when it struck the initiator firing linkage bell crank, withdrawing the initiator sear pin and firing the initiator.

It would be worthwhile to take a look at your egress system training procedures now.



human fod

Fortunately few of us ever experience or witness a human being sucked into a jet intake. Surely no one wants to be the victim or even witness such an event. Even so, once in a while someone ends up as human FOD.

When the pilot of an F-4 preparing for takeoff was unable to get the interline fuel tank to feed, he returned the bird to the hard stand for troubleshooting.

After installing the chocks, the crew chief came on interphone and requested 85 per cent rpm for a pressurization check. After about 10 seconds at 85 per cent the pilot felt and heard a thump. He immediately shut down and egressed.

A fuel cell maintenance man had been checking the pressurization of the centerline fuel tank. For some unknown reason he walked out from under the aircraft, in front of the left intake duct, and was sucked into the intake. He struck the bellows air probe in the left intake which undoubtedly prevented his being sucked farther into the engine and saved his life. His glasses and other personal items were ingested into the engine.

This airman was lucky. Not too many go through the same experience and live to tell about it. If you value your life, be sure you know the danger areas of the aircraft you're working on.

wheel bearing failures

The following, from the Canadian Armed Forces Directorate of Flight Safety, addresses specifically a problem with the CF-104, but it could apply to any aircraft! If the shoe fits. . . .

During the first years of the CF-104 program, wheel bearing failures occurred with unsettling regularity. Bearings in most cases were ground and welded together into a potpourri of metal art forms. In the other cases, the balls rolled along the ground instead of in their races.

UCRs (Unsatisfactory Condition Report) flew around the system faulting the lubricant, the bearings and the wheels, and each wheel bearing was sent to the Materiel Lab for analysis. No materiel changes were incorporated as a result of the UCRs, but the wheel bearing failures gradually began to diminish.

The reason for the decrease in failure incidents was attributed to more vigilant and careful maintenance:

- Tire bays were cleaned up and provided with better cleaning and greasing equipment, eliminating micro-FOD that could foul the bearing races and balls;
- Bearing cups and cones were kept as matched sets (the tolerances of bearing components are extremely small);
- And finally, the correct wheel installation procedures were emphasized. (The torquing procedure appears to be redundant but it is there for a good reason—to protect the bearing.)

Wheel bearing failures are not isolated incidents, but they still occur, and the causes of failure have a familiar ring. Cleanliness and adherence to the EOs (Engineering Orders) will keep the failure rate down. ★

THE HERO WORKER

Incident reports and UMRs indicate that there has been a marked increase in engine spline coupling failures. In this article an old hand with jet engines offers some wisdom and advice on how to prevent spline problems and accidents.

Complex machinery, like society, has its unsung heroes. They usually perform in an admirable manner, are well qualified, dependable, unobtrusive, well liked and unheralded. Before you reach the conclusion we are speaking of you, we have to announce our subject, in this instance, is the aircraft engine *spline coupling.*

This mechanical object is a precision machined shaft that transmits power train torque loads to a generator, hydraulic pump, CSD or starter. In the case of a starter, it carries the torque in reverse. The spline coupling usually has a necked down area between its splined ends that is designed to fail at a torque value that would not cause failure of the engine gear train system should the accessory seize or lock up for some reason. Occasionally it has a short, double end shaft that acts as a go-between, or it can be an integral part of a pump or starter drive. The photos above show some different forms a spline shaft can take. Notice the various degrees of wear on the unserviceable exhibits.

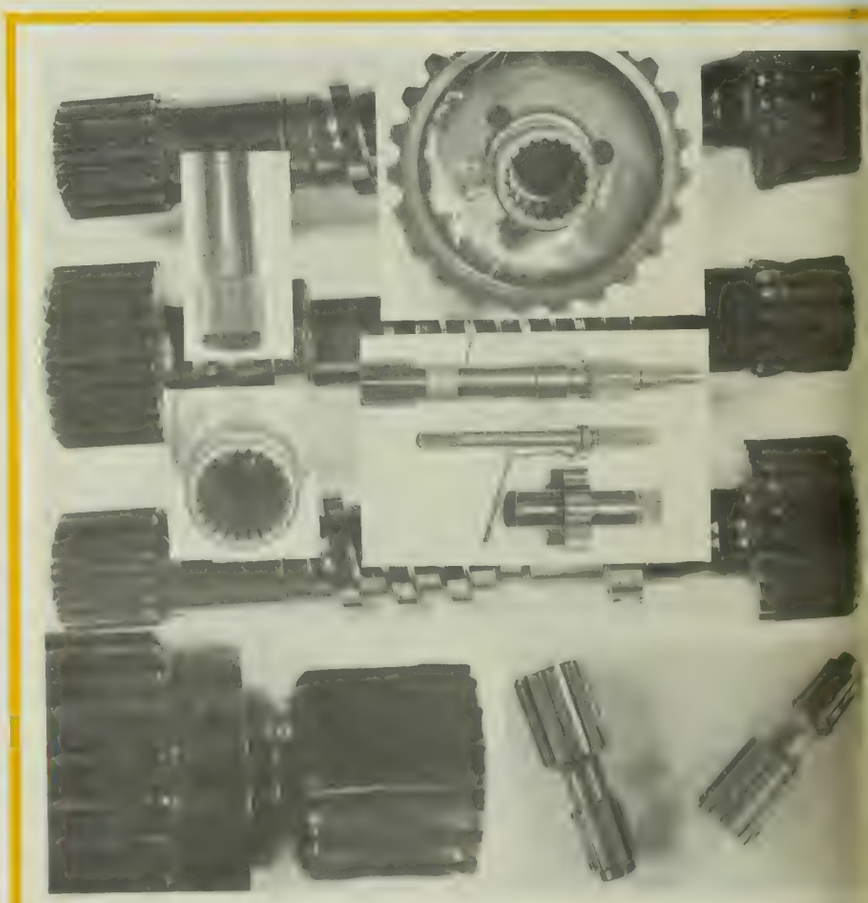


FIGURE 1

In order to appreciate why we feel this part is a HERO, you must realize the Herculean task these splines perform. It is not uncommon to have accessories that require or produce loads of 20 hp or more. For example, the F-105 utility hydraulic pump pulls four horsepower at its rated 24 gpm flow. Visualize the size of a four horsepower motor! This will give you an idea what our "Hero" has to contend with for thousands of hours. Remember, too, in many instances the loads are not smooth torque but are subjected to pulsations and chatter.

Because of the high torque loads and pulsations, splines must be cleaned and lubricated with the correct lubricant each time an accessory

HAROLD POEHLMANN, Fairchild Hiller Corp, Republic Aviation Division

is installed. Without this lubrication the metal to metal contact will produce rapid wear and, eventually, complete failure. Figure 1 shows typical failures. Remember, when a spline gives up the ghost there is a sudden stoppage of an important aircraft power plant accessory. Should it be a high pressure fuel pump spline on a single engine fighter you automatically have an unpowered glider with dubious gliding abilities.

The most prevalent "spline killer" is the absence of lubrication or the use of the wrong type lube. When a spline starts to wear through its case hardening, rusting accelerates its destruction and the process is fairly rapid. When you notice a spline assembly that contains an abrasive red oxide rust material or caked grease, it is usually a sign that it has been operating with the incorrect lubricant or without lubricant altogether.

We failed to mention that there are two general types of spline applications, *Wet* and *Dry*. The *wet* pad spline operates in a bath of oil, usually from the gear box system, and requires no special attention except for making sure it is clean, that the gasket on the mounting pad is new, and that accessory attachment torque values are correct. The *dry* spline is the one that is not getting the treatment it deserves. Don't be fooled into thinking that there is no relative movement in a spline coupling so, therefore, there is no critical need for lubrication at assembly.

The chart (Fig. 2) shows some of the different types of high pressure lubricants that are called for in the

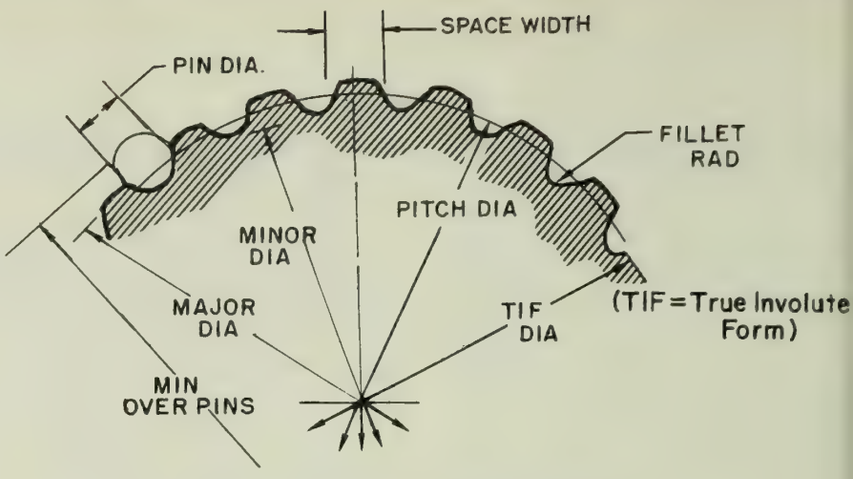
SPLINE

A-7D Starter	*MIL-G-81322*
OV-10 Fuel Pump	*MIL-G-81322*
F-105 Fuel Pump	*MIL-G-3545*
F-105 Generator	*MIL-G-3545*
F-105 Hydraulic Pump	*MIL-G-3278*
F-84F Starter	*Eclipse Pioneer #3*
F-100 Hydraulic Pump	*Plastilube #3 or MIL-G-21164*
F-100 Fuel Control	*Plastilube #3*
F-100 Cartridge Starter (Wet Spline)	*No Grease*
F-100 Pneumatic Starter	*Plastilube #3*
J-57-13 Fuel Pump	*Plastilube #3 or Moly #3*
T-28 Oil Pump (Wet Spline)	*MIL-L-6082 Grade 1100 Engine Oil*
T-28 Fuel Pump (Wet Spline)	*MIL-L-6082 Grade 1100 Engine Oil*
T-39 Fuel Control (Wet Spline)	*No lube*
H-53 (H) Starter	*Corrosion Preventive Compound (MIL-C-6529 Type 1)*

Note: The above listing is for reason of illustration and is subject to changes. Consult your maintenance instructions for latest information.

FIGURE 2

HERO
Continued



FILLET ROOT EXTERNAL SPLINE

See Specification NAS 881 for Additional Data

various maintenance manuals. Don't guess as to the type of lubrication that your equipment requires; it could be a costly guess! Consult the maintenance instructions, use the exact type mentioned and apply as recommended. Before you re-install an accessory with a spline shaft be certain you research the tech order to determine whether it requires special lubrication, and note the proper application technique. Remember also that we can sign the death warrant for a *wet* spline if we fail to use a new base flange gasket or fail to adhere to the attaching hardware torque values. A leaking spline cavity can cause a *wet* spline to wear prematurely and eventually lead to complete failure. As you can note from the accompanying photos the wear takes the form of "hardly perceptible" to "no question."

There are two methods of checking spline wear. One is by use of special go-no-go gages, usually found in a factory or overhaul agency. The typical field method, "mike and wires", should be accomplished by a machinist using the proper NAS 581 measuring criteria. You must clean both the male and female spline parts and inspect visually. If there appears to be wear, measure to determine if the parts are airworthy and relube as directed in the installation technical order.

The other problem connected with rapid spline wear is caused by a bent spline coupling, which usually results from a heavy accessory being allowed to hang on the spline during installation. Some accessory gear box pad studs or adapters do not have precision aligning pins, shoulders or studs that can support the weight of the unit until the unit is up against the flange. So the mechanic must provide a method of supporting the full weight of the accessory during the installation and at *no time* allow the weight of the accessory to be supported by the spline shaft. If this is allowed to happen a bent spline can result. I realize that most accessory compartment areas are congested and not the easiest places to man-handle a 20 to 50 pound accessory. It is here that Yankee ingenuity can be put to use. Some late model aircraft have AGE slings and lift supports for this operation. (I saw an improvised device back in 1948 made by modifying an adjustable swivel chair. It did a fine job until the Wing Commander noticed an identifying mark that caused him to recognize his long-lost office furniture.)



As suggested in the popular (in my day) song, "Try a Little Tenderness," try a little with our unsung hero, the spline. One thing is certain, longer spline life will result and, who knows, maybe your attention to detail, without your ever realizing it, will save a valuable pilot and aircraft. ★



Toots

is interested in your problems. She spends her time researching questions about Tech Orders and directives. Write her c/o Editor (IGDSEA), Dep IG for Insp & Safety, Norton AFB CA 92409

ar Toots

I read with avid interest your December issue and oyed each article. Of particular interest to me was OTS' questions and answers about AFTO 781 es forms. While they constituted an excellent review the material, I feel compelled to mention a not inificant error. The answer to question number 11 erred to TO 00-20-2. The actual reference is TO 20-1, paragraph 3-10, dated 15 Mar 70, Change 1, un 70.

TSgt James A. Nield
42 ARRS
Hamilton AFB, Calif

nks, you're right.

Toots

* * *

r Toots

his pertains to the batteries of all types that are l with and in emergency communications radio sets l in survival kits or deployed from airplanes. Some- g somewhere stipulates these three restrictions:

1. Batteries will not be used or installed when their age has exceeded their shelf life, or will exceed the shelf life before the next scheduled inspection.

2. A battery will not be installed in a radio set or used with a radio set for more than one year even though it has not exceeded its shelf life and still tests serviceable.

3. Spare batteries will be installed in survival kits when the radio sets are such that the batteries can be easily changed, and the same rules apply as for installed batteries.

I have seen these instructions and complied with them in USAFE, but now I cannot find anything on it.

MSgt Alfred W. Berntson
443 AMS
Altus AFB, Oklahoma

Dear Sarge

Two of the three restrictions that you recall relative to personnel locator beacons (PLB) and survival radio batteries are still valid.

The applicable technical orders state that batteries with an accumulated service and shelf life of 24 months will be replaced regardless of condition. Battery life limitations are the same for spare batteries. The above restrictions are for the URT-27 PLB (para 2-4c, TO 12R5, 2URT 27-2), RT-10 (Fig 1-8, TO 12R2-2URC10-2), URC-64 (para 2-12d, TO 12R2-2URC-64-2), and the PRC-90 (para 2-13, TO 12R2-2PRC90-2) survival radios. Paragraph 3, TO 12R5-2URT33-2, establishes a 21-month replacement criterion for the URT-33 personnel locator beacon battery. As a result of your letter, I questioned the Life Support Inventory Manager on this variance since URT-27 and -33 batteries are interchangeable. The URT-33 technical order will be changed to reflect 24 months.

The second restriction you recall for one-year replacement of batteries from installed date was a Tactical Air Command restriction outlined in their 501 series Life Support regulations. This restriction has since been deleted.

Spare batteries are authorized for installation in survival kits and vests at the option of the using command. This requirement is currently stated in various command Life Support regulations (e.g., TACR 501-4, PACAFR 501-6).

Toots



NUCLEAR SAFETY AID STATION



DISCONNECT -THEN TEST

Would you use a nuclear weapon to test Aircraft Monitor and Control (AMAC) circuitry? I hope you have all answered NO! Would you try to duplicate an AMAC malfunction if one is reported during an alert preflight inspection? Now the answer may not be so positive—but it should be. Trying to duplicate AMAC malfunctions on a weapon loaded aircraft *does* amount to using the weapon as a tester. As general nuclear safety philosophy, once an AMAC malfunction has occurred don't try to get everyone and his brother to verify it. The two-man concept already insures verification—of procedures and results. The errant system should be shut down and both the munitions maintenance supervisor and the safety supervisor should be informed. Then, if troubleshooting is required, unload the weapon, or at least disconnect it. If weapon characteristics are important to troubleshooting, use a proper type training weapon. Remember, the answer to both of the questions in the beginning of this article is an emphatic NO!



NO AID REPORT NO ACTION

A nuclear-capable aircraft crashed recently and destroyed due to the failure of a component in the b rack. The accident occurred during the release bomb dummy unit (BDU) at low altitude. The acc investigation revealed that some malfunctions and ures of the rack had been occurring over the past



A MID-WINTER REMINDER

Well, it has been cold, but it could get colder more snow is surely coming. Although your operat have been going well, another reminder should avoid problems. Several areas require special attent Inspection requirements for convoy routes should reviewed and strict compliance enforced. Do they clude snow removal criteria? Reduced speed lim Increased spacing? Equipment inspections should phasize items such as hydraulic lines, electrical cab and pneumatic brake lines which are more likely t damaged in cold weather. Vehicle operation is also important area. Reduced visibility and slippery pe and shoe soles tend to cause trouble. Increased phasis on chocking is also a good idea. During airc loading and unloading there are always problems connector mating and cable routing. Adding nu fingers and brittle material doesn't help things. Be ticularly careful, especially when you are cold anxious to finish the job. The added time increases misery but not as much as an AID investigation.

ears. In one case, a rack failure was apparently not ported at all. In several other cases, rack deficiencies ere reported in Materiel Failure Reports but not as uclear mishaps. AFR 127-4, Atch 3, directs that malnction or failure of suspension and release systems ust be reported as a Dull Sword when nuclear safety involved. Such an occurrence on a rack capable of rrying a nuclear weapon certainly involves nuclear fety regardless of what (if anything) was on the rack at the time of the occurrence. The prevention of AIDs relies in large part on trends revealed through our reporting system. Had all failures and malfunctions on this rack been reported as AIDs, it is possible that the rack deficiencies would have been corrected and this accident prevented, thus saving millions of dollars and a vital combat aircraft. Your full participation in reporting AIDs is necessary for the nuclear safety program to work. It depends on you.

EXPLOSIVES SAFETY

John H. Kawka, Directorate of Aerospace Safety

never make the same mistake once

But until we reach that very desirable goal, we have to learn as much as we can from the other guy's mistakes as well as our own.

The best part of our progress in explosives accident prevention results from recognizing mistakes that have been made and applying the knowledge gained to our own jobs. To do this properly we need tools, and the USAF Ground/Explosives Safety Kit, which contains articles and briefs on accidents, along with recommendations for preventive and corrective actions, is one of the best tools available.

If an accident occurs at one base, it can occur at another—that's basic. People who live through an accident quickly learn what is needed to prevent recurrence—that's also basic. It seems reasonable that people at other bases can learn just as quickly from that experience, without having to undergo the painful personal involvement.

Of course, the corrective actions and precautionary measures recommended in the articles are often old-hat to our more experienced explosives safety people. Nevertheless, explosives accident reports usually tell of people *who knew the accident potential,* but who failed to apply those necessary precautions.

When an explosives accident is briefed or featured in the safety kit, supervisors and affected individuals in all similar units are expected to review their local operations and take immediate steps to insure that such a mishap won't happen to them. But when an identical mishap does occur, it's obvious that the articles received little attention.

The old wartime slogan said, "We do the best we can with the tools we got." Some of your tools are the "Explosives Safety" briefs and features published in this magazine, in the Explosives Safety portion of the USAF Ground/Explosives Safety Kit and in TIG Brief. They just *might* help you avert a turn in the barrel. ★



IT'S A MANUAL

Your January issue contains a article titled, "Hot Ground Wire" the Tech Topics feature. You refe ence AFR 127-101 in closing t story. Our office copy of AF Reg lation 0-2, dated 25 August 197 lists AFM 127-101. I can find AFR listing. Could the referen possibly be an error?

Paul E. Robins
21 Air Force
McGuire AFB,

You are right, it's a manual, a reg.

* * *

"WHAT'S A LEFT DOWNWIND?"

The item in your December issue, "What's a Left Downwind?", makes everyone a little disgusted, not just military pilots. But I am almost certain that this particular knothead is a direct example of the kind of primary instruction he had been receiving. I don't suppose I would know what a left downwind was unless somebody told me, which a good instructor did a long time ago. But the run-of-the-mill, mediocre instructor these days is prone to this sort of thing. He certainly should never have turned a student loose with that little knowledge.

If you will look just a little behind the pilot of Cessna 123, you will probably find a careless and indifferent instructor, and therein lies the trouble.

Max Karant
Senior Vice President
AOPA, Washington, DC

I AM AN INSTRUCTOR?

Several years ago I bought a 1954 Ford. After driving it for a short while, I found that it possessed a few built in problems. The most troublesome problem, by far, was that for some unexplained reason the lights would periodically go out. Having less money than time, I raised the hood and traced the problem to a circuit breaker in the engine compartment. I found that when the lights went out, a slight tap on the circuit breaker would restore operation.

Being dutiful and safety minded, I explained to my wife about the little black circuit breaker and how to tap it to make the lights operate.

A few nights later, my wife attended a PTA meeting. It was very late when she finally returned home. The car lights were out when she drove into the driveway. I asked why she was so late and why the lights were out. Her sad story (in no uncertain terms) was touching to say the least. As she left the school, she explained, the lights on the car went out. She informed me that she knew exactly where the circuit breaker was and just how to tap it, if ONLY she had known how to raise the hood!

MORAL: If not thoroughly given in proper detail, instructions and procedures are usually wasted effort.

MSgt Gerald M. Lewis
ATC Flight Safety Kit

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UNITED STATES AIR FORCE

WELL DONE AWARD

Presented for outstanding airmanship and professional performance during a hazardous situation and for a significant contribution to the United States Air Force Accident Prevention Program.

COLONEL
Joe H. Joiner

MAJOR
David H. Pinsky





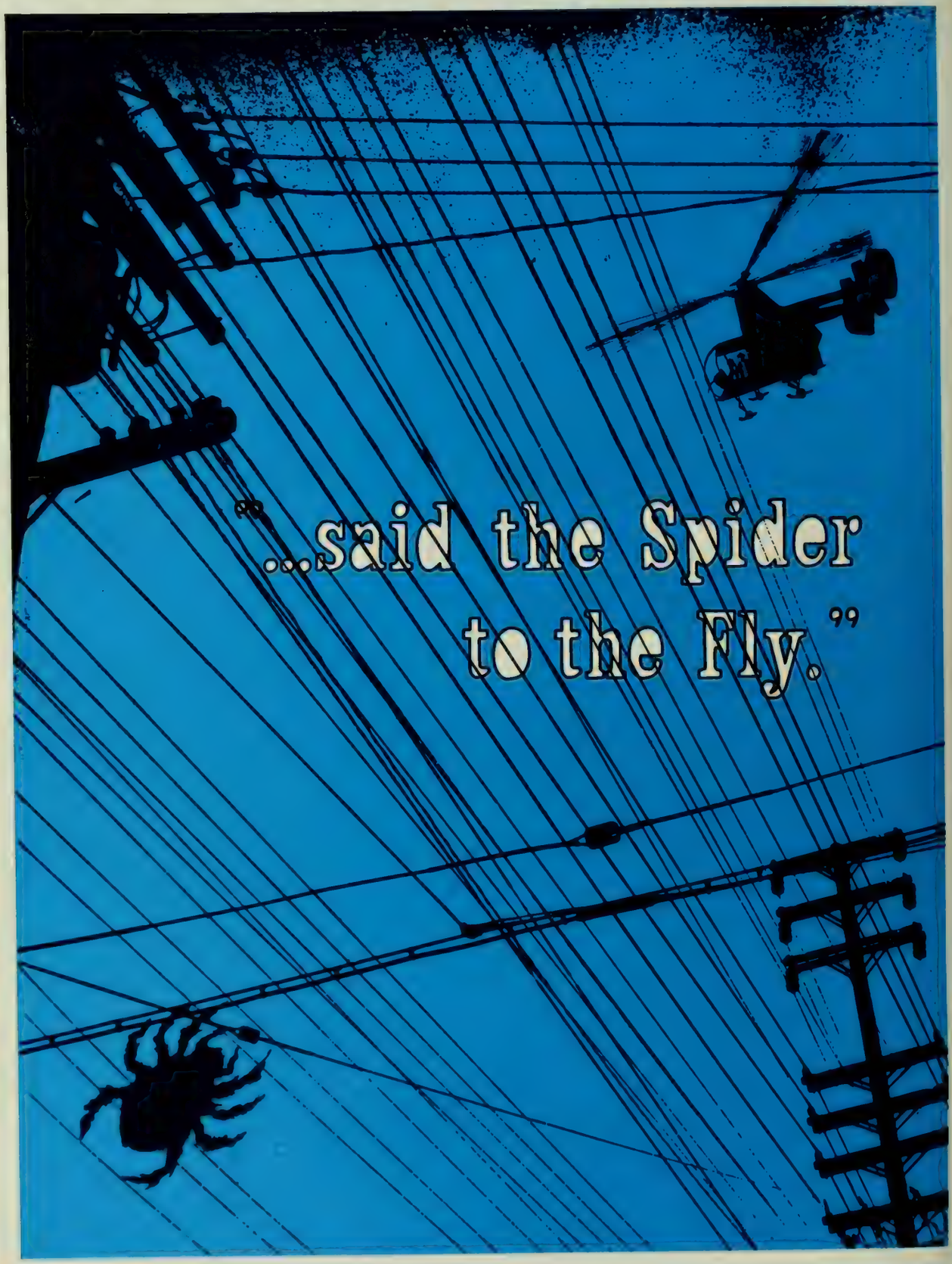
48th Fighter Interceptor Squadron, Langley AFB, VA.

On 19 November 1970, Colonel Joiner and Major insky departed El Paso International Airport in a -33 on an IFR flight to Little Rock AFB, Arkansas. fter 20 minutes at cruise, both pilots heard a muffled xplosion and noticed an immediate decrease in RPM rough 85 percent and a slow decrease in EGT. The rottle was retarded and a right turn initiated in the rection of Abilene for an emergency landing. A check aircraft systems revealed that the left rudder pedals both cockpits were useless, and that any power set- g above idle caused severe vibration. Declaring their nergency with Fort Worth Center and requesting ctors to the nearest suitable runway, the pilots con- ued a right descending turn while establishing best de speed and completing the flameout and loss of oil essure checklists. Selecting Abilene Municipal Air- rt as their best emergency landing site, the pilots tisoned the external tanks over the desert.

Approach Control advised that no barrier was avail- le, nor was any crash support equipment on station. ortly thereafter, the pilots were plagued with inter- m problems, making cockpit communication difficult. ection was considered at several points throughout descent, and both pilots accomplished their pre- ction procedures. Each time, the alternative of eject- was held in abeyance since the flameout approach med to offer a reasonable chance of success. Major sky, in the front seat, assumed control of the air- craft at 10,000 feet MSL. Passing through 7000 feet they sighted the runway at their 11:30 position. Surface winds were reported as 260 degrees at 15 knots, gust- ing to 25 knots.

Major Pinsky made a left turn to place the aircraft on base for runway 17 and lowered the landing gear with the normal system. The left gear indicated unsafe, and the system was immediately recycled. All gear indi- cated safe on the second attempt. During this time, the intercom system became operative again. Major Pinsky selected half flaps and aimed for a point 2000 feet down the runway. As he initiated the flare, the aircraft yawed to the right into the wind and, as the flare continued, yaw became more pronounced. The right yaw had to be countered with left aileron, since the left rudder was inoperative. The aircraft touched down approximately 1500 feet down the runway. Major Pinsky applied brakes and raised the canopy to slow the aircraft, halting the aircraft on the runway with no further damage.

Inspection revealed that high-velocity debris from failed turbine buckets had severed the left rudder cable and torn a large hole in the left side of the fuselage. The superb skill of both pilots, and their ability to act as a team in an emergency situation, resulted in a serious emergency being handled without injury and with minimum damage. WELL DONE! ★



See Fly High
Page 20

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FLYS

Aerospace SAFETY

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APRIL 1971

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an aircraft lost in an accident will never hit the target

UNITED STATES AIR FORCE

APRIL 19

Aerospace SAFETY

FOR AIRCREWS, MAINTENANCE & SUPPORT TECHNICIANS

SPECIAL FEATURES

THE ROLE OF SUPPORT IN THE USAF MISSION... *"and don't you forget it"*
SUCCESS STORY... *safety deficiencies CAN be corrected*
TO BE OR NOT TO BE... *Shakespeare on tech orders*
THIS TRAIN DON'T CARRY NO PASSENGERS... *if you ride, you work*
VIOLATIONS... *from professional pilots?!*
BENT WITH THE WIND... *landing problems*
NOISE! NOISE! NOISE!... *protect your sense of hearing*
ATTITUDE DIRECTOR INDICATOR... *a pesky F-4 problem*
FOOTNOTES TO FOLLY... *with a dash of salt*
T-BIRD FLAMEOUTS... *careful preflight planning may help*
F-105 FLIGHT CONTROL CORROSION... *the danger of superficial inspections*
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APRIL 1971 AFRP 127-2 VOLUME 27 NUMBER 4

THE ROLE OF *SUPPORT* IN THE USAF MISSION

Everybody knows that the mission of the U. S. Air Force is to fly and fight. It's not too tough to identify this mission and the role played by the knuckle busters on the flight line. We do find, though, that it's tough sometimes to weave the function of the support force into the big picture. We can, however, give you some examples of how they should not fit into the big scheme. Let's talk for a moment about a young airman we recently heard about.

He took his six-month-old baby to the dispensary (the baby apparently had a bad cold). The medics gave him some nose drops and aspirin for the baby and sent him home. The airman wasn't satisfied with this treatment so he took the baby to a local doctor. After a careful examination, the doc determined that the child had pneumonia and admitted it to the hospital.

After the dust settled and the baby was well, the hospital naturally presented the young airman with the bill, which he was unable to pay. Next question, how about CHAMPUS? He didn't know about CHAMPUS nor the benefits he was entitled to under the program (the education for which falls under another support function). He took his problem, and rightly so, to his supervisor who helped him get the whole thing squared away.

Remember, though, during the course of this experience, the young airman was working at his job which involved repair of aircraft engines. Now it's rather obvious that this young man was under a great deal of mental stress, his baby sick with pneumonia, and a hospital bill bigger than his wallet. Who could we pin the blame on if the young troop skipped a step or two on the checklist, and the omission resulted in a lost aircraft or a dead crew?

We can't hide our heads in the sand and refuse to admit that this type of thing does happen. It's the responsibility of the Air Force to insure that everybody is physically and mentally able to function at peak efficiency. Was this man able to devote his undivided attention to his job?

It's not our intention to single out one particular support function and throw rocks. This type of thing can happen in similar areas. How about a sloppy mess hall that offers poor quality food to our men. Ever had a thorny pay problem and find a disinterested type who instead of trying to help you, only showers you with paper work and red tape?

These examples are representative of situations that we can't ignore. There may be complacency in *your* support function because those who serve in this capacity are unable to relate to the major role of the Air Force. Believe me, there *is* a relationship and every support function commander is obligated to insure that his troops are providing the very best service, so we can do our mission of "flying and fighting." ★

SUCCESS STORY

Maj John T. Taylor, Chief of Safety
Ellington AFB, Texas

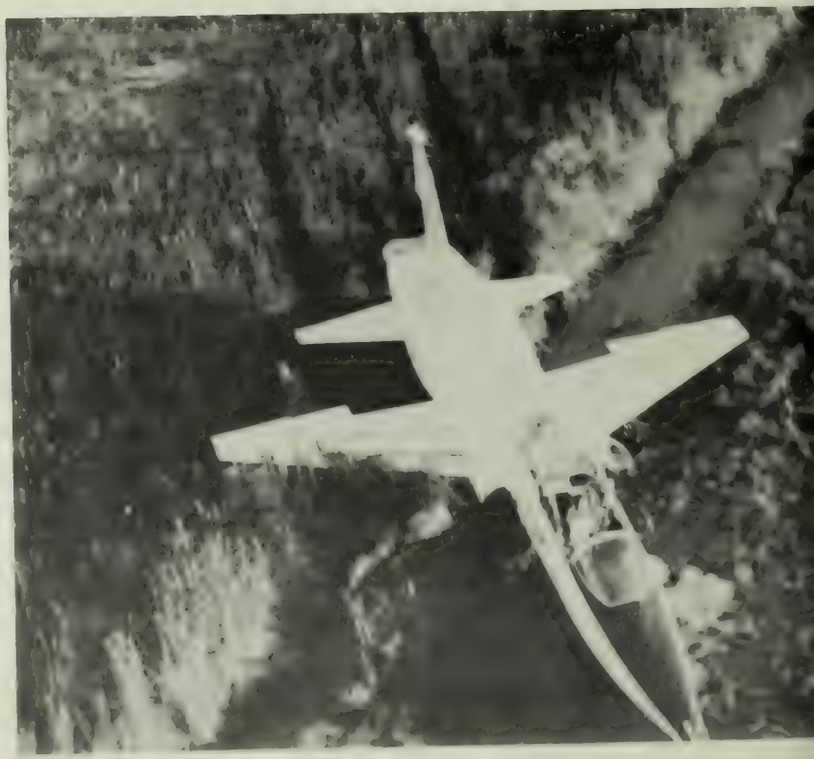
This story is primarily for you Safety engineers / technicians who have nearly reached the "bitter end" of your will to continue fighting to correct safety deficiencies. The deficiencies we're discussing are those which have been in existence for two or more years. You have brought them to the attention of management, but you get the feeling that your efforts are a useless endeavor. Let me boost your morale with a success story at Ellington Air Force Base, Texas.

In the fall of 1967 we Safety types at Ellington got together and formed a mutual alliance for accomplishing a joint, overall base safety program. Initially this alliance consisted of myself as Base Safety Officer, and other safety officers for NASA-MSC (Manned Spacecraft Center), the U.S. Coast Guard Station (Houston, on base), the 446th Tactical Airlift Wing (Air Force Reserve), and the 147th Tactical Fighter Group (Texas Air National Guard). It has since grown with additional units being assigned to the base.

Our first order of business was an accident prevention (safety) survey of the base, restricted to our "most critical" items in only the airfield area proper. Some of the findings of the survey follow.

Soil erosion of serious proportions was discovered near aircraft operation areas. Since we had aircraft occasionally leave the paved surfaces, it was evident that it was only a matter of time until one found one of these five-foot ditche The mishaps shown in photos through 3 proved our hypothesis be correct.

Aircraft arresting systems cap bility consisted of two modifi MA-1A chain type arresting gear runway 17/35 and two BAK-9 sy



1. CY 1968



2. 1969—T-34 right main gear collapsed during landing. Aircraft swerved off.



3. 1970—T-33 Brake failure.

tems on runway 04/22. None was equipped to accommodate non-tailhook aircraft. Only one arresting system, the BAK-9 on the approach end of runway 04, was capable of approach end engagement, and its capability was marginal, due to surface irregularities on both sides of the hook cable and the fact that the cable was in a depression caused by a cut made across the runway when the BAK-9 arresting gear was installed. One look at photo 4 should prove convincing.



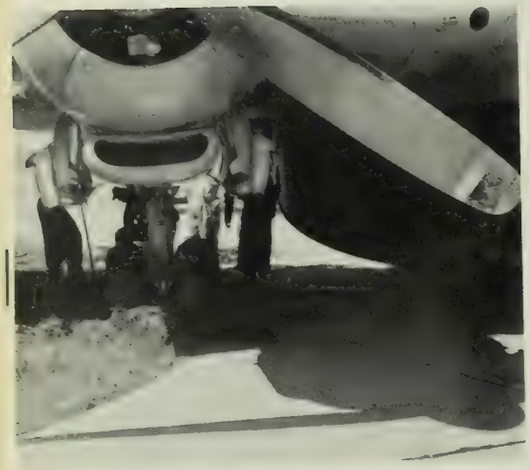
4. BAK-9 aircraft arresting barrier.

Poor vegetation control and blocked drains, precluding proper water runoff, made Ellington a wildlife paradise. We were home for such varieties as the Atwater prairie chicken, two alligators, red fox, wolves, deer, stray cows, and other assorted species.

Airfield lighting was woefully inadequate. Night operations were unsafe in most areas. We usually had most of our runway and taxiway lights during good weather, but when it rained and we needed them most, they shorted out—ancient wiring and fixtures couldn't take the moisture. Only the instrument (?) runway, 04/22, was equipped with high intensity runway lights (HIRL). Only 04 had approach lights and these were of marginal value for night operations and worthless during bad weather. The runways were equipped with threshold lights and 22 had VASI lights, but only an ASR approach was available to this runway! Further, our primary instrument runway, 04/22, was only 6800 feet long. Not very good for fighters and high performance trainers such as the T-38.

Night operations, especially during inclement weather, were positively unsafe on the parking aprons, due to no lighting and poorly defined guidelines. The fact that mishaps were infrequent attests to the professional skill of the pilots. Some visiting aviators were not so fortunate, as depicted by photos 5 through 7. The edges of aprons, taxiways (except the southeast) and runways were not stabilized with macadam or concrete. At night it was difficult to tell the difference between the paved surface and the mud.

Approach aids consisted of an ancient GCA in fixed position which provided precision approaches (PAR) to runway 04 and surveillance (ASR) service to all other



5. CY 1969—WV-1 stuck.



6. CY 1969.



7. Navy 3-2 dropped

SUCCESS STORY

CONTINUED

runways. This equipment's age was offset by its being operated by highly professional personnel; therefore, ground controlled approaches (GCAs) could and still can be flown with confidence. Other approach aids consisted of a TACAN and an omnirange, both fine for day VFR practice approaches.

There were obstacles in the runway overruns. Vehicles frequently crossed the approach end of runway 17 overrun and drivers often failed to stop and check for approaching aircraft. Fences off the ends of all overruns were not of the frangible, break-away type. The approach to runway 04 contains power lines, a highway, railroad, junk yard, a sewer treatment plant, and a drainage ditch. Approaching runway 35, aircraft must cross this same area, but in addition there is a power pole three feet below the lower limit of the glide slope, and rough terrain.

At first our survey seemed doomed to failure. Nevertheless, we continued to press the issue and ou efforts received a real welcom boost from the USAF Director Aerospace Safety. In July 1968 the conducted an aircraft accident pr vention (flight safety) survey Ellington. Their findings confirm ours. Base surveys for calend years 1968 and 1969 were repe performances boosted by safety su veys from our major air comman Headquarters Air Force Reserv We continued our combined effo and our higher headquarters ke up their support. Ultimately thin began to happen.

NASA-MSC funded for stro lights at the ends of 04/22 a 1600 feet of overrun for runway 2 We now have a local base resc (LBR) helicopter unit, a vehicle signed to safety, eroded areas fil in, drains cleared, and expanc vegetation control which has c couraged the wildlife.

A million dollar contract been let to refurbish our long (90 feet) runway, 17/35, as the prim instrument runway. This project cludes high intensity runway lig proper runway markings for inst ment flight operations, and mod approach lighting. The Texas National Guard is funding the stallation of two BAK-12 arrest systems. Further, our GCA is be sited on a turntable, and an ILS been funded and the site survey My boss, the base comman thinks this is pretty darned go We Safety types know that pe verance does pay off! ★

TO be or not TO be

Sqn Ldr Donald Melvin, RAAF
Directorate of Aerospace Safety

Last year the USAF recorded the lowest accident rate in its history. We didn't just "luck out", either; that 3.0 accident rate was a result of hard work, cooperation and determination. Unfortunately, we could have done better, as the following random sample of transport aircraft and helicopter accidents shows:

Two H-43 helicopters were destroyed, one with the loss of two lives, due to maintenance malpractices. In one, the overspeed governor shaft was not replaced after work had been performed on the fuel control. In the other, a control rod was not properly safetied after installation, and it subsequently failed with catastrophic results.

An AC-119G experienced engine failure just after takeoff on a night mission. Aircraft performance was not sufficient to maintain flight, and six crew members died in the crash and ensuing fire. The TDR confirmed that this low-time engine quit because of failure of the primary impeller drive due to cumulative stresses from numerous "out of tolerance" conditions in the impeller system.

When a reciprocating-engine aircraft is refueled with JP-4, it's not going very far. It didn't! Scratch one C-54D two miles off the end of the runway.

An incorrectly adjusted nosewheel steering cartridge caused a C-123K to leave the runway on the takeoff roll. The pilot retarded throttles to idle, but the aircraft continued on and came to rest in a swamp—with the jets still burning at 100 percent. Had the pilot selected reverse, the jets would have been shut down and the aircraft would not have gone into the water, which ultimately corroded the aircraft beyond economical repair. Thus, two mistakes destroyed an aircraft.

Two maintenance technicians were detailed to taxi a C-131A aircraft to its parking spot on the ramp. Number one engine started normally, but number two back fired badly and would not start. The aircraft was taxied on one engine. After it was parked, the technician decided to look at the troublesome number two. Lo and behold! Number two cylinder was missing, and no entries had been made in the form 781! An engine change was the order of the day.

The common denominator in all of these examples was that a technical order was not diligently followed. The loss of five aircraft was bad enough, but what value can be placed on the eight crewmembers' lives? Unit Effectiveness Inspections are still regularly revealing gross deficiencies in the proper use of TOs.

There never seems to be enough time during a task to follow a TO; but time is always found to examine the consequences. There is no excuse for not using the relevant TO, no matter how simple the task or how many times you've done it before. Supervisors must cooperate by insisting and insuring that TOs are used. ★



this train don't carry no passengers

the GIB-- passenger or participant?

Capt Richard Anderegg
78 Tactical Fighter Squadron
APO New York 03405

The F-4 back seat is occupied by a variety of trade men: pilots, navigators, EWOs, radar-navs, bomb navs, flight surgeons and instructor pilots. Once i the "pit," however, they all mold into a unique one ness—**the Phantom GIB.** All too often, though, th result is a phantom gib, a passenger, a man along fo the ride, who shares nothing, says little and might ca even less.

How does a young tiger fresh from pilot trainin an eager fighter-gator straight out of Mather or a experienced SAC nav-bomb turn into a back seat war body in a Mach 2 aircraft? Maybe his aircraft com mander likes to play Thackery Thud pilot and tel him to stay *cold mike* until instructed to do otherwis Maybe he has the "I can fly better than he can" att tude or, perhaps, he feels that decision making respons bility is not his and consequently does not feel incline to contribute to the mission. A good bet might be bor dom. Never mind the causes, though; corrections a my interest.

One of my good buddies in SEA let the A/C an bird bust the minimum altitude on a nearly VFR nigh the F-4 hit the ground a mile or so short of the ru way and burned, but both walked away uninjured. M friend, the GIB, didn't mention the minimum altitud until they had passed through it—too late. I firm believe each GIB should have his own personal min mums and should discuss them with the A/C befo each flight. Do you have a hard, absolute altitude which to start recovery from a dive bomb pass? Or d you assume that your A/C does? How about a min mum airspeed or two? One for IFR; one for VF Flying three feet in trail and hitting the ground secon isn't much consolation for you or your family.



All of you strong minded A/Cs can relax; I'm not advocating yanking on throttles and stick from the back seat. I've invested well over two years in the engine room, and I've never taken an airplane away from anybody. It simply isn't necessary, if the GIB is totally involved in the mission and is absolutely positive the A/C is aware of what's happening.

The airplane has a fine intercom that is best put to use by doing the old "I'll tell you mine, if you'll tell me yours" trick. Mike Batsel was an old head GIB in the Triple Nickel when I started my tour in SEA, and he believed in a continuing, uninterrupted commentary from back to front. Some crews prefer the commentary to run front to back and others mix it up. Whatever the direction of dialogue, both people should be aware of unusual occurrences. Silence is not golden in the F-4.

How well do you know the front seat, you back seaters? Well enough to remind a temporarily disoriented A/C where the ARI circuit breaker is? A passing acquaintance isn't good enough if you're flying a demanding mission. Knowing his cockpit as well as your own makes things a lot more comfortable when the going gets tough.

Night flying is when the GIBs of the world excel. One of the finest tail gunners I've ever seen in action is Van Horn, a GIB with the 22nd at Bitburg. Van always believed that a back seater's job at night is to be a standby altitude reference system. Lights on nice and bright (the inside ones, you know) seat lowered, hands on the canopy rail and a constant cross-check of the numbers and dials. It's hard enough to see outside in the daytime and damn near impossible at night, so keeping heads up on the gages can be a rewarding and contributing occupation.

I was briefing for a night mission last year when an A/C mentioned that he wondered if GIBs sometimes get altimeter fixation on night dive bomb passes. He asked if we were cross-checking airspeed and attitude as we called off altitudes. I allowed as how I pretty much concentrated on the altimeter 'cause that was the priority information. Not a good technique, I found out a couple hours later. We started to roll in, and I stuck my head in the scope to get a quick dive toss lock-up. The horizon line came to wings level and I locked her up. Smartly pulling my head from the scope, I called 10 grand, 9, 8 then looked at my ADI. Black over gray. Hmmmmm. After much immediate confusion and yelling between cockpits we got the airplane rolled upright and pulled out. The A/C had continued his roll out into a 45 degree dive—inverted. Nowadays, I look at all the dials and numbers.

The pit is not a command position, but it does require a responsible attitude. It demands a dedication that can't be ignored. I truly shocked myself a few months ago when I dragged an enroute supplement out of the map case and realized that I wasn't sure which number was the field elevation. A small indication that my instrument procedures were slipping? NO, A BIG ONE! I was slowly sliding into a bad case of the backseat drearies. The prime example of a complacent assistant fighter pilot.

A receptive, responsible attitude is essential to a successful mission. The desire and drive to set workable minimums, to actively participate in the mission, to keep the guy in front informed at all times and to constantly improve personal knowledge are the ingredients for a top-notch crew. Not having the pole in our hands is no reason to become a passenger. This train don't carry no passengers. ★

THE I.P.I.S. APPROACH

By the USAF Instrument Pilot Instructor School, (ATC) Randolph AFB, Texas

TERMINAL APPROACH CHARTS

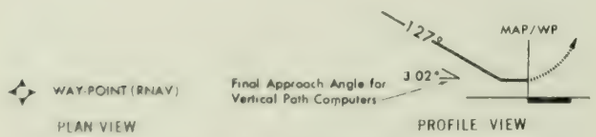
Q What are the geographical coordinates on an approach chart?

A The coordinates on the approach chart indicate the *approximate* center of the aerodrome, expressed to the nearest minute.

Q Can I fly a designated VOR instrument approach procedure using TACAN equipment when the approach is designed off of a VORTAC facility?

A No; AFM 60-16, para 8-4(a) states, "The destination must be served by an operational facility for which an instrument approach is published and capable of being flown with navigational equipment aboard the aircraft." When an approach is designed using a VORTAC facility, it is normally designated a VORTAC approach. This is permissible when the azimuth elements can support a VOR/DME or TACAN instrument approach (requires transmitting antennae to be within 100′ of each other). If these azimuth requirements are not met, the approach must be designated either VOR or TACAN, whichever provides final approach course guidance. By flying the VOR approach while using TACAN, you would not have *proper final approach course guidance.*

Q The legend of the low altitude instrument approach procedures (charts) show the following:



Please explain "Way-Point" (RNAV).

A Way-Points are used for Area Navigation (RNAV). According to FAA Advisory Circular #90-45, dated 8/18/69, Way-Point is defined as a pre-determined geographical position used for route-definition and/or progress-reporting purposes that is defined relative to a VORTAC station passage. Two subsequently relayed Way-Points define a route segment. At present the are no USAF aircraft *certified* to use Area Navigati routes and/or instrument approaches.

Q What are terminal feeder routes on instrument a proach charts and what are they used for?

A Terminal feeder routes are bearing and distan from an enroute structure to the initial approach cility/fix. They are used to transition from the enrou structure to the initial approach facility/fix for t instrument approach to be flown. Be aware that some TACAN or VORTAC approaches, the feed routes are to the *facility,* not to the initial approa fix. This normally is done because of air traffic routi requirements.

POINT TO PONDER

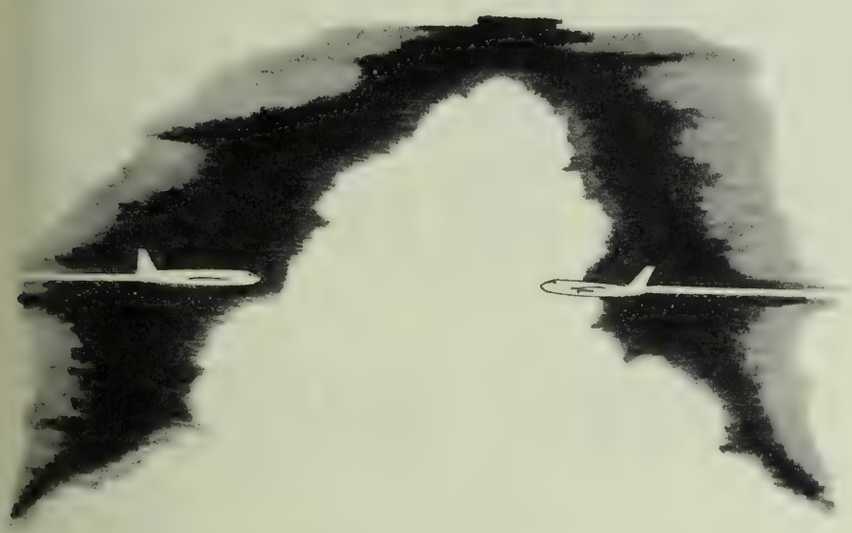
Assume you are cruising at FL 300, 75 NM DM from destination and ATC clears you for an enrou descent to cross the 25 NM DME at 5000′. WH pitch change could you make to reach 5000′ at the NM DME? ANSWER: 5 degrees (no wind).

A simple and quick computation was made to arri at this answer; simply divide the altitude to be l (25,000′) by the miles to fly (50NM). This gives y a descent gradient of 500 ft/mile. Since a 1 degr pitch change provides a descent gradient of 100 f per mile, regardless of airspeed, 5 degrees decrease pitch from *level flight* will give you the necessary 5 feet per mile descent.

After establishing the 5 degree pitch change, che to see if you lose 500′ within one mile. Adjust yo pitch 1 degree for every ± 100′ difference from t 500′. For example: If you lose 400′, increase yo pitch to 6 degrees; if you lose 700′, decrease your pi to 3 degrees. This will help to compensate for wind.

Since this technique will give "ballpark" figur always "round" mileages and altitudes off to numb you can easily work with, i.e., 33,000′ to 30,000′; NM to 80 NM. This technique may appear comp cated; however, after using it a couple of times, y will find it very easy and certainly a handy guide.

VIOLATIONS



FLY YOUR ASSIGNED ALTITUDE

Lt Col Lucien O. Sonnier, Directorate of Aerospace Safety

The number of Air Force flying violations varies from year to year, but there is one thing we can count on: the types remain the same. Home town boys are still compelled to show off before the folks; pilots are too proud to take notes or repeat altitudes; navigators rely solely on questionable equipment when making ADIZ penetrations. The most common quote of violating pilots remains, "but I was VFR."

Flying violations for 1970 involved FAA, ADIZ, AFR and one national boundary infraction in which a C-131 on a cross-country flight crossed another country's border inadvertently.

One-half of the infractions were violations of FAA regulations. These ranged from an ANG F-86H landing on a taxi strip to an A-1 and F-4s buzzing below 1000 feet over congested areas. The rest were general air traffic control violations such as a T-33 climbing, or a B-52 descending, through assigned altitudes; a C-130 flying the wrong airway; a B-52 off course 150 miles; a T-33 SID deviation and a T-33 flying through Restricted Areas without clearance.

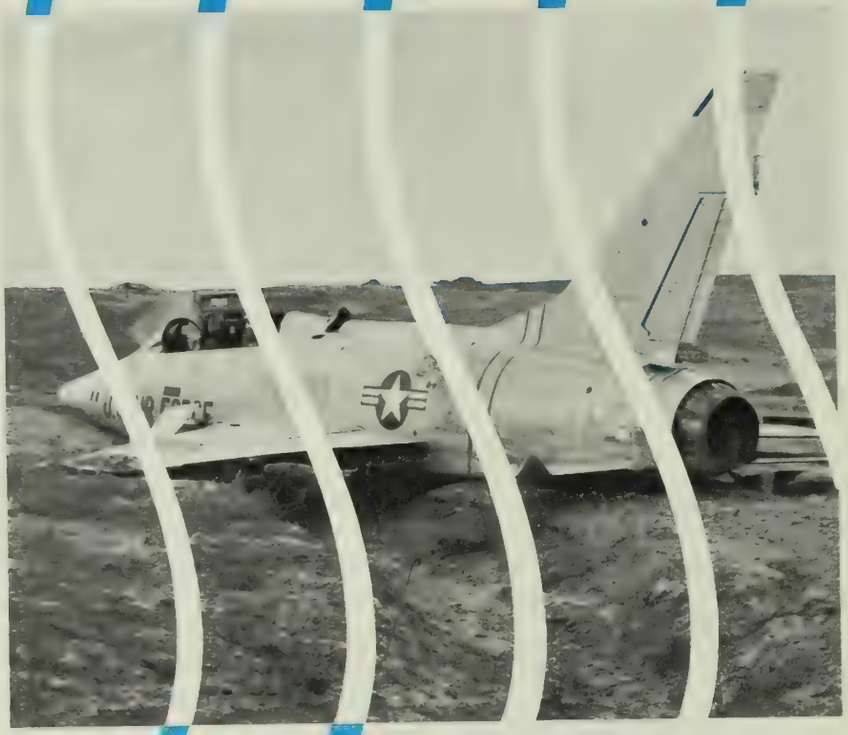
An F-4 driver acknowledged a change of altitude from 310 to 290 but 80 miles later, met a Boeing 727 at FL 310 head-on for a near-miss. The airline captain said the F-4 filled half of his windshield as it went by. The T-33 mentioned above climbed through assigned FL 250 and also found himself head-on to a 727 airliner at FL 270.

There were four ADIZ violations involving a KC-135, two C-141s and a Reserve C-97.

AFM 60-16 was reported violated five times. An F-84F and a T-38 were reported buzzing and two T-38s were doing acrobatics, one on an airway and the other in an airport control zone. An Army UH-1D pilot reported an F-101 buzzing close to his aircraft but the investigation could not substantiate the allegation.

The only reason most of these violators were caught was because the transgression was reported by someone else. How many unreported violations occur remains unknown. Another question that comes to mind is, "how many cause unknown accidents were the direct result of a pilot violating regulations?"

Death and destruction are a high price to pay for immature showing off. Ego gratification is certainly not becoming to a true professional, and every pilot of substance accepts this as a fact of life. ★



t bend with the wind

The "Hun" pilot was number two in a flight returning from a day combat mission. Everything had gone well, the ordnance had found the target, everything OK. Taking over visually from a straight-in, precision GCA, the pilot maintained a crab down final, compensating for a 22-knot crosswind, and transitioned to wing-low in the flare. After a normal landing, the airplane began veering left and the pilot straightened it out with differential braking. Positive control re-established, the pilot raised the flaps and deployed the drag chute. When the chute popped the airplane veered left again, and full right rudder had no effect.

He darned near made it. If the runway'd been a little wider, or he'd realized that nosewheel steering w inoperative, or he'd jettisoned drag chute when the airplane he ed off the second time, he'd pr ably have been okay. But the wind wheel went off the edge, into the sand and another cr wind landing accident found its to the big computer's memory ba

Orville and Wilbur realized effect the wind had on their chine. They went to a lot of trou to move their operation to a pl that had very constant, favora wind conditions. Since that ti wind at or near the surface has c tributed to more bent hardware t any other weather phenomenon, cepting, possibly, lightning and h In the past decade the Air Fo has had some 300 aircraft mish

in which wind was a contributing factor. If it were just wind alone, most of us could cope pretty routinely with the problem. But there are a passel of other factors which can complicate the problem.

• **LOW CEILINGS:** It's a basic rule that a good landing starts with a good approach. This is doubly true with a crosswind to complicate things. If ceilings are low, and the breakout point doesn't allow a lot of time to line up and establish the proper correction for crosswind, things can go bad in a hurry.

• **SLICK RUNWAYS:** That neat little crosswind limitation chart in the back of your Dash 1 is based on a dry—repeat, *dry*—runway. Any time runway conditions are such that tire friction is decreased, crosswind tolerance of the airplane is similarly decreased. Hydroplaning is a serious problem in and of itself, but most hydroplaning *accidents* happen in crosswind conditions.

• **GUSTY WINDS:** Maintaining a tight rein on your bird is essential, and a gusty crosswind—even one well within limits—can cause real problems. With a strong, steady crosswind, the pilot can establish smooth (albeit considerable) control inputs throughout the approach, flare, touchdown and rollout. Throw in a big gust, or take one away, and suddenly the established control inputs are inappropriate and the time for rapid corrective action is here!

• **DRAG CHUTES:** Once the thing is deployed, it tends to act like a great big weathervane, and in strong crosswinds adds to the pilot's problems. In addition to its weathervaning tendencies, on a slick surface the drag chute will cause considerable downwind side loads.

A number of other things can have a direct effect on the sweat-factor of crosswinds. A nosewheel, for example, exerts a counter-force to the wind in a weathervaning situation (the pivot point being the main gear, of course), but a tailwheel, particularly a castering tailwheel, offers virtually no resistance to the push of a crosswind. By the same token, in a hydroplaning situation the side friction on the main wheels is practically zero, while that of the nosewheel, which isn't hydroplaning, is unchanged. The *nosewheel* then becomes the pivot point, and useless as a steering device.

There are a few new airplanes being produced on which the main gear is set well back toward the tail. Because the flat-plate area ahead of the gear is greater than that aft of the gear (even including the vertical stabilizer), these aircraft tend to weathervane *away* from the wind.

Anytime the relative wind is at an angle to the longitudinal axis of the airplane, the downwind wing is at least partially blanked out. Since this is the wing we try to raise in a wing-low approach, higher than normal aileron inputs may be required. This problem is seriously aggravated with a swept-wing; the relative wind on the upwind wing approaches an angle *perpendicular* to the leading edge, giving very high lift conditions, while the relative wind on the downwind side moves toward an angle *parallel* to the leading edge with a resultant decrease in lift. In addition, since the relative wind is always (hopefully) from the front, and the wings sweep aft, the tendency of the fuselage to shelter the downwind wing is increased.

The Navy can minimize the problem by turning their runway into the wind, but we land-lubbers have to cope. There are a lot of things we can do, and while the list below is by no means definitive, perhaps you can identify an area or two in which some extra attention wouldn't be wasted.

1. **Know thy airplane.** Review the Dash 1 limitations and recommendations. Practice crosswind landings when the opportunity arises. As in all things, talking the problem over with older, wiser heads can't hurt (we have to learn from the mistakes of others; none of us will live long enough to make them all ourselves).

2. Be ready to take **fast** corrective action. Several birds went off the runway last year still flying their drag chutes. Expeditious jettisoning might have made the difference.

3. Whatever you do, **don't** get locked into a situation that doesn't leave you some kind of an out. Stay flexible, stay alert for changing conditions. If we can bend *with* the wind a little, we won't end up getting bent *by* it. ★

NOISE ! NOISE ! NOISE !

Maj John P. Meade, Directorate of Aerospace Safety

Many of us make noise while making a living, but not many of us enjoy it. To some, noise is a valuable guide to the performance of mechanical contrivances. To others, it's a woofer laboring over the latest stereo hit. Somehow, the racket from our neighbor's air conditioner, his son's car, or the local utility company's jack hammer can never be conveniently turned off. To most of us, then, noise is a nuisance—or worse, a health hazard.

Noise has become such a problem that many states and municipalities have adopted ordinances regulating it. Coverage ranges from the noise level of entire neighborhoods to that of "animals, birds, hawkers, and peddlers," and penalties range from 25 to 500 dollars and/or 60 days in the local cooler. The latest, most comprehensive, is the Walsh-Healey Public Contracts Act, which compels manufacturers to protect their employees' hearing if they deal with the Federal Government.

What is noise? Noise has two aspects. Taken one way, noise is something you sense, something you feel inside—like a headache. You can hear noise, recognize it as a low-pitched rumble or a high-pitched whine. Technically defined, noise is any unwanted sound. And although this definition may seem naive, it is also remarkably sensible. It combines both aspects of noise: the sound outside of you and the feeling inside of you. According to this definition, too, one man's noise can be another man's music. *Bach* is noise to some; *Three Dog Night* is noise to others.



USAF HEARING CONSERVATION PROGRAM

The Air Force conducts one of the largest and most comprehensive hearing conservation programs in existence. The purpose is twofold: **to conserve the hearing of all military and civilian personnel routinely exposed to noise, and to insure continued retention and utilization of skilled and valuable personnel.** This program is large because it encompasses all military and civilian personnel who are exposed to potentially hazardous noise. Additionally, audiometric examinations are performed as part of entrance and separation physicals on all military and civilian personnel, regardless of whether they a routinely exposed to hazardo noise. The program is comprehe sive because it incorporates the f lowing efforts:

There is an education and indo trination program concerning t undesirable effects of noise. T program covers undersirable noi ear protective devices, and metho and techniques used to effectiv control or limit undesirable no exposures.

Next, areas where potentially hazardous noise exposures exist are identified and specific noise exposure limits are established for people working there. Ear protection devices are then issued to each individual who must work in these potentially hazardous noise areas.

Prior to an individual's starting work in these areas, pure tone threshold audiograms are completed, representing a pre-exposure baseline, and periodic reevaluations are routinely accomplished on all these individuals.

Lastly, all hearing conservation data and information are maintained in permanent records and files of the individuals concerned. This last step will assist and protect the best interests of both the person and the Air Force.

Prevention of noise-induced hearing losses requires that noise control measures be initiated at the beginning of the individual's noise exposure work life and continued throughout his career. Such prevention depends greatly on awareness of potentially hazardous noise exposure and discipline on the part of the man to wear the ear protection devices furnished him. Ironically, many men who routinely work in extremely hazardous noise environments will not lose their hearing due to this noise because it is so intense that they use their ear protection; yet they will expose themselves to off-duty noise (trapshooting, motorcycle and sport car racing) that subsequently may cause a loss of hearing.

Extensive research, primarily by Major Donald Gasaway and his group at the USAF School of Aerospace Medicine, Brooks AFB, Texas, clearly emphasizes the fact that noise does not have to elicit pain or even discomfort for it to cause a permanent loss of hearing acuity. In fact, noise which does not elicit ear pain or discomfort constitutes the largest range of exposures which eventually cause permanent sensorineural type noise-induced losses.

In order to protect people from this insidious noise, engineering surveys are accomplished throughout bases and at specific duty stations. Through accurate sound level measurements, dangerous areas and operations can be identified and proper protective measures employed. These will include proper ear protection, limited exposure time, and periodic audiometric examinations to determine if the first two actions are accomplishing the desired effect: *protection of the person*. In the event that ear protective devices are not sufficient to prevent damage, then it becomes necessary to use engineering and operational measures to reduce noise. Such measures might include the use of engine exhaust and intake suppressors, sound-isolated engine test stand control booths, increasing the distance between the noise source and operating personnel, and a reduction of exposure time.

While there are many sources of noise on an air base, jet engines are probably the most frequent contributor. The engines of most jet powered aircraft produce noise that exceeds the threshold for unprotected ears and limit individual exposure time even with the use of ear plugs and muffs.

For example, the J-57 engine in the F-100, at 250 feet behind the engine, produces noise that should limit the unprotected person to 2.5 minutes per day, and only one hour with plugs or muffs. With both, permissible exposure increases to 10 hours per day. The use of afterburner reduces all these times by 75 percent.

One of the worst is the J-75 engine in the F-106, which produces 136 decibels (db) and 144 db in afterburner. Times for it are (100 feet behind the engine):

	Unprotected	W/Plugs or Muffs	W/Both Plugs and Muffs
No AB	5 sec/day	1 min/day	19 min/day
With AB	1 sec/day	18 sec/day	3 min/day

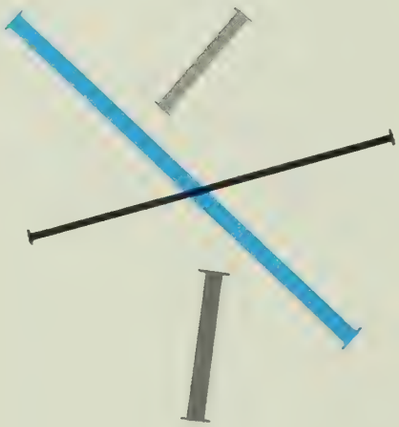
So you can see the importance of using plugs and/or muffs. The newest aircraft in the inventory, the C-5, also has the biggest engines, but at 250 feet behind the engine, the noise is only 115db, considerably less than that of the KC-135 and the C-141 engines.

In summing up the program, we can say that the individual is the key to its success. All attempts directed at educating noise-exposed personnel must be aimed directly at the individual. If this effort is successful and each individual is thoroughly convinced that unprotected exposures to noise may result in hearing loss, then avoidable hearing losses will be kept at a minimum. Remember, the hearing you save will be your own! ★

REQUIRED EAR PROTECTION

DECIBELS	REQUIRED EAR PROTECTION
0-85 DB	NO PROTECTION REQUIRED
85-100 DB	EAR MUFFS OR EAR PLUGS REQUIRED
ABOVE 100 DB	EAR MUFFS AND EAR PLUGS REQUIRED
135-145 DB	EAR MUFFS AND EAR PLUGS REQUIRED. LIMITED TIME EXPOSURE
ABOVE 145 DB	PROHIBITED

(doubtful) attitude (director) indicator (disaster)



Maj Richard E. Hamilton
Directorate of Aerospace Safety

There I was, making an 0200 takeoff, the weather at minimums. I had just picked up the flaps when the GIB screamed, "Roll out! Roll out!"

"Why?" I said, "the ADI is level."

His voice went up about two octaves, so I decided he was serious. I'm not sure how high we were when he got us out of inverted flight, but it wasn't high enough. I still don't know how we missed that hill off the end of 22.

How many times have you heard a similar "war story"? F-4 crews have a good supply of such stories. They follow a familiar theme: night, weather—in other words, tough going. For example:

• Immediately after takeoff, in night/weather, the aircraft commander transmitted that he had lost his flight instruments. During the ensuing maneuvers to get the aircraft back to the field, the aircraft struck the ground. Two fatalities and the loss of one Phantom.

• While transitioning from formation to instrument flight, at holding fix, the wingman became disoriented and lost control of the aircraft. The aircraft commander could not determine the attitude of the aircraft during violent maneuvering. Result: One F-4 destroyed, one fatality (the GIB forgot to hook up his chute risers).

What are we doing about it?

You probably know that TCTO 1F-4-924 will add a standby attitude indicator to the front seat. The first 200 of these kits should have been in the field by March 1971. The target date for fleet conversion is December 1971. Additionally new maintenance ground test procedures have been implemented and more sensitive test equipment has been ordered to measure ADI bearing wear. The experts are continuing to test the ADI in order to determine the exact cause for failure. Fixes take time, however, so the same problems may be with us for awhile.

Regardless of these fixes, one problem will always be with us. That problem is instrument interpretation. Even when we have two attitude references in the front cockpit we will have to make the right choice when they disagree. The back-seater, whether pilot or navigator, must be able to recognize unusual positions and warn the aircraft commander.

Have your local procedures been reviewed and updated to provide complete crew coordination training for your GIBs? Do you feel that elements of your program are worthy for inclusion in command supplements? Have you submitted recommendations to the MAJCOMs? Remember, the final responsibility for the major portion of GIB training lies with each individual aircraft commander. Can your GIB give you the kind of crew coordination *you* need? ★



REX RILEY'S CROSS COUNTRY NOTES

An alert transient services NCO brought to our attention that perhaps most pilots were unfamiliar with some rather important aspects of TO 00-20-5 (which deals with flight reports and supporting maintenance records.) The two paragraphs, which are of primary concern to transient pilots, are important enough to quote for your information.

"1-91. If routine inspections and minor repairs cannot be made promptly, because of lack of personnel or material, and the pilot of the aircraft desires to proceed on the flight without accomplishment of such inspections or minor maintenance work, the aircraft may be given an Exceptional Release. When such circumstances prevail, the pilot will be advised that maintenance was not performed because of lack of facilities, parts, or personnel, and a brief entry to that effect will be entered on the AFTO Form 781A. The transient maintenance officer will place his signature in the Discovered By block for this entry. When stops are made at non-Air Force installations the pilot of the aircraft is responsible for the accomplishment/omission of the required routine inspection or minor maintenance, to include applicable AFTO forms' entries, i.e., preflight, postflight, etc. The pilot will grant the Exceptional Release and sign the release on the form.

"1-92. If the pilot desires omission of the required routine inspection or minor maintenance work in order to permit prompt resumption of flight, even though personnel and facilities are available locally to make the required inspections and to accomplish the necessary maintenance work without undue delay, a written request to such effect will be entered on the AFTO Form 781A by the pilot. The base transient aircraft maintenance officer may grant such a request if he concurs that the aircraft is in safe operational condition. In such cases, the Exceptional Release will be signed by the transient aircraft maintenance officer. When this is impracticable, the pilot will grant the Exceptional Release and sign the release on the form. (A duplicate copy of the AFTO Form 781A and 781H pertaining to such entries may be made to indicate work or servicing accomplished or refused. These copies will be retained on file by the transient aircraft maintenance officer for not less than 30 days.)" ★



REX RILEY
Transient Services Award

BUCKLEY ANG BASE

AURORA, COLO.

LORING AFB	Limestone, Me.
McCLELLAN AFB	Sacramento, Calif.
MAXWELL AFB	Montgomery, Ala.
HAMILTON AFB	Ignacio, Calif.
SCOTT AFB	Belleville, Ill.
RAMEY AFB	Puerto Rico
McCHORD AFB	Tacoma, Wash.
MYRTLE BEACH AFB	Myrtle Beach, S.C.
EGLIN AFB	Valparaiso, Fla.
FORBES AFB	Topeka, Kans.
MATHER AFB	Sacramento, Calif.
LAJES FIELD	Azores
SHEPPARD AFB	Wichita Falls, Tex.
MARCH AFB	Riverside, Calif.
GRISSOM AFB	Peru, Ind.
PERRIN AFB	Sherman, Tex.
CANNON AFB	Clovis, N.M.
LUKE AFB	Phoenix, Ariz.
RANDOLPH AFB	San Antonio, Tex.
ROBINS AFB	Warner Robins, Ga.
TINKER AFB	Oklahoma City, Okla.
HILL AFB	Ogden, Utah
YOKOTA AB	Japan
SEYMOUR JOHNSON AFB	Goldsboro, N.C.
ENGLAND AFB	Alexandria, La.
MISAWA AB	Japan
KADENA AB	Okinawa
ELMENDORF AFB	Alaska
PETERSON FIELD	Colorado Springs, Colo.
RAMSTEIN AB	Germany
SHAW AFB	Sumter, S.C.
LITTLE ROCK AFB	Jacksonville, Ark.
TORREJON AB	Spain
TYNDALL AFB	Panama City, Fla.
OFFUTT AFB	Omaha, Nebr.
ITAZUKE AB	Japan
McCONNELL AFB	Wichita, Kans.
NORTON AFB	San Bernardino, Calif.
BARKSDALE AFB	Shreveport, La.
CHANUTE AFB	Rantoul, Ill.
KIRTLAND AFB	Albuquerque, N.M.

footnotes to folly



"OK, I'M PARKED BY A FIRE HYDRANT, SO WHAT?"



"AH! COME ON, CHIEF, YOU'VE GOT TO BE KIDDING--MUSH?"



"HOLD ON, HARRY, WE'LL HAVE YOU OUT OF THERE IN 30 MINUTES."



"I'LL SOUR ON YOUR STOMACH."

"HE'S GOT TO BE AROUND SOMEWHERE. HIS HAT'S STILL HERE."





"NO, SARGE, YOU CAN'T BURY IT HERE."



Maj David H. Hook, CAF, Directorate of Aerospace Safety

Chances are good that a great many T-Bird drivers who were around during the years of the Great Flameout panic think that the problem was solved way back in the middle 1960s. At that time, we discovered that anti-icing alcohol would turn into a gooey mess, plugging up some critical holes in the main fuel control. Figuring—rightly—that the cure was worse than the original problem, we disconnected the alcohol system. We also improved the fuel control and added an anti-ice inhibitor to the fuel.

So what's the problem? Well, we did reduce the flameout rate by about fifty percent, but a glance at the accompanying graph will tell you that the flameout problem not only persists today but seems to be on the increase. The figures do not include flameouts that were due in any way to a malfunction of any aircraft or engine system. If the present trend is not reversed, at least seven pilots this year can look forward to their T-33s winding down unexpectedly at an awkward moment.

HIGHER RISK IN "PLEASANT" MONTHS

If you fly a T-Bird a review of the circumstances surrounding recent flameouts may help you to avoid being one of the seven. First of all, during flight through heavy precipitation, a flameout should **not** be "unexpected;" the flight manual is very specific on this point. In recent years only a few flameouts fit into this category. Here are the circumstances surrounding the rest:

Cruising Level: FL 240 to FL 290 the "comfortable" altitudes. (These old birds seem to climb more slowly every year, and the pressurization isn't all that great.)

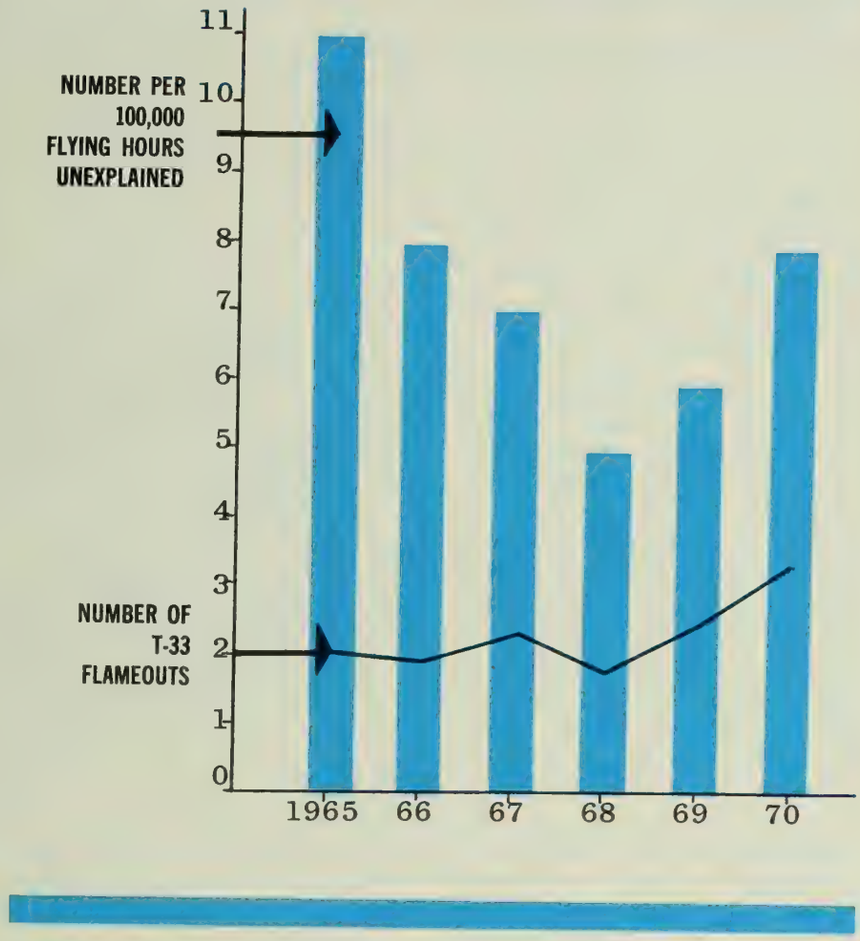
Season: The "pleasant" months May to October in the northern hemisphere, when air temperatures are generally higher than normal at these flight levels.

Weather: Varied, but generally visible moisture was present. A few aircraft merely climbed through clouds and were cruising in clear air. Most were cruising in haze or stratus cloud for an hour or so. Some were in light precipitation, encountering very light rime icing.

Time at Altitude: About one hour at a fixed throttle setting. Generally, flameouts occurred about the time the tip tanks went dry and the main wing tanks were turned on.

The causes of these unexpected flameouts remain a matter of conjecture even after all these years, and there are many theories, of varying degrees of merit, to explain the flameouts. These theories fall into two basic categories: an incorrect fuel-air ratio at the burners; or an interruption of fuel flowing to the burners.

An incorrect fuel-air ratio is most likely to occur when heavy precipitation or any amount of icing is encountered. The flight manual warns of induction icing, where a crust of ice forms over the inlet screens of the impeller, restricting the flow of air and resulting in engine surging and high EGT. The fuel-air ratio might also be disturbed by ingestion of large quantities of water, either as slush or heavy rain. Converted to steam by the compressor, this water causes burner blowout due to a lack of oxygen. Ice encrustation of the main fuel control aneroid bellows is also thought to cause a false sensing of higher altitude, thus resulting in burner blowout due to insufficient fuel. During some flight tests in March 1965, a T-33 was subjected to an abnormally heavy ice accretion at 16,000 feet and −24°C temperatures, and no engine difficulties were noted. Nonetheless, inlet ice and heavy precipitation are proven causes of some flameouts.



FUEL SYSTEM PROBLEMS

To grasp the scope of the problems within the fuel system, we need to understand the nature of JP-4. Present standards call for delivery to the aircraft of a fuel that contains 0.1 percent anti-icing additive and no free water. "No free water" means only that at delivery temperature any water present will remain in suspension as microscopic drops; large drops of water will not form on the bottom of the tank. However, *the fuel will very likely be saturated or nearly saturated with suspended water.* As the temperature of the fuel decreases, eventually the level of super-saturation will rise to the point where free water drops will precipitate. At this point the anti-icing additive goes to work, dissolving in the water and lowering its freezing point.

The temperature of the fuel changes in many ways. Cold soaking occurs at altitude. As the stuff is pumped it warms and, as it flows through an orifice or a filter, it cools. Consequently water and even ice are very likely to be present to some degree at various locations in the fuel system on every flight.

Flying in moisture in any form—precipitation, cloud, or even humid clear air—aggravates the fuel-water problem. Under these conditions, compressor bleed air, which pressurizes the tip tanks, will be heavily laden with water vapor. As this air

cools, the water condenses, accelerating the formation of pools of water in the tips. Then, as the amount of free water increases and dilutes the anti-icing additive, the freezing point of the water rises. If this free water gets past the low pressure fuel filter into the engine fuel system, flameout becomes a very real possibility.

ENGINE FUEL SYSTEM ICING

There are many points where ice can form in the engine fuel system, particularly in the main control which is filled with orifices and crevices where ice can cause trouble. In the mid 1960s several modifications were made to reduce the susceptibility to icing, but still the opportunities for ice formation persist. Flameout occurs when ice finally blocks the flow of fuel, as indicated by a low or zero fuel pressure reading.

FREE WATER AT THE FUEL MANIFOLD

Even if the free water doesn't freeze in the engine fuel system, flameout might occur if a large enough slug of water arrived at the burners instead of JP-4. In this case a significant change in the indicated fuel pressure would be unlikely. Although the validity of this theory has not been determined, flameout due to "free water fuel starvation" doesn't appear to be too far-fetched. Pooled water in the tips could pass into the fuselage tank, and turbulence caused by fuel entering from the wing tanks could send a slug of water instead of fuel into the engine fuel system.

INVESTIGATION CONTINUES

As a result of 1970's flameout record, the T-33 System Manager at Sacramento has instituted an intensive study of the unexpected flameout phenomenon. Victims and flight safety officers will be required to submit detailed reports to describe flight profiles as accurately as possible.

First of all, if an unexplained flameout occurs and a relight is obtained on the emergency fuel system, pilots will be expected to remain on the emergency system for the remainder of the flight so that the fluid inside the main fuel control at the time of flameout may be analyzed. Secondly, maintenance personnel will be expected to search in every conceivable cranny for any evidence of water in the aircraft and engine fuel systems.

Finally, the pilot will be asked to state such particulars as:

1. Elapsed time and fuel consumed prior to takeoff.

2. Elapsed time, fuel load, and engine and flight data at the time of flameout.

3. Instrument changes or fluctuations before, during, and after flameout.

4. Route weather and flight conditions such as OAT, cloud type, visible moisture, icing.

5. Fuel tank sequence and time of selection.

AVOIDANCE AND PREVENTION

An obvious over-reaction to this article would be to prohibit T-33s from entering clouds. We could also prevent flight accidents by locking aircraft in hangars. However, as this flameout problem seems to be related to a GRADUAL BUILD-UP of water in the fuel system, the sensible approach is to minimize the time spent in cloud and to avoid prolonged flight in the conditions described earlier in this article. Cruising above 30,000 feet may be inconvenient and uncomfortable, but the air holds a lot less water.

Another obvious method of prevention is for maintenance personnel to thoroughly drain the fuel system prior to flight. Work order cards and checklists give all the pertinent details. Particular care must be taken to insure that the tip tanks are free of water. To make this easier, a modification has recently been approved to install spring-loaded drains on the tips.

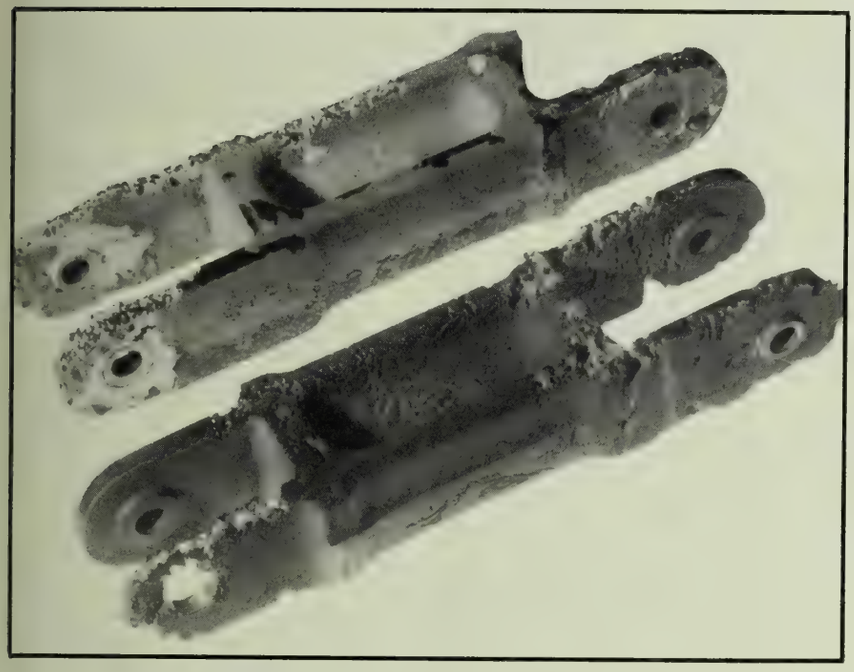
If an unexplainable surge, fluctuation, or decrease in rpm occurs in flight (where I come from it's called the "Lake Superior Twitch"), select Emergency Fuel, leave it there, and have an investigation made for evidence of water in the main fuel control and high pressure filter. If the engine quits completely, a snappy selection of Gangstart before the rpm decays will hopefully relight the fire with a minimum of anxiety.

In 1970 only one Bird refused to relight after an unexplained flameout. A fault in the ignition system prevented any current from getting to the igniters. Similar problems in other aircraft were identified, so hopefully this failure won't occur again.

The "pleasant" months will soon be here. If you're a T-33 driver, you might want to brush up on your SFO patterns *now*. Careful preflight planning during the flameout season may also save you some inconvenience and excitement midway through your flight. ★

F-105 FLIGHT CONTROL CORROSION

George E. Kammerer, SMAMA, McClellan AFB, Calif.



F-105 Flight Control Stick Link Rod Corrosion PN 79F340012-1

How would you like to fly the airplane the part above came from? The part is a pitch control link rod from an F-105. As the result of two separate instances of such severe corrosion of F-105 pitch control link rods, SMAMA, prime AMA for the '105, initiated an urgent TCTO.

As shown in the photographs, one end of one of the link rods was sawed off for lab analysis. Chemical analysis indicated that urine appeared to be a factor in the corrosion of the part. This may indicate that maintenance/service personnel and crew members best be more careful about relief container spillage in the cockpit. The other, and most severely corroded, control link rod had been immersed in water or exposed to an excessively moist environment in a non-draining control stick well of an F-105 based in Florida over a period of time. This part is the only magnesium component of the system, and magnesium is very susceptible to corrosion.

Since phase injections require inspection of the subject area, specifically during the fifth phase, it is hard to believe that the degree of corrosion indicated occurred between inspections. Is it possible that the difficulty of adequately checking the area may have been a factor in these inspections being done superficially, or not at all?

Interim urgent action TCTO 1F-105-1155, 3 Feb 71, has been sent out to all F-105 units. The above photograph of a grossly corroded control link should assure compliance with the TCTO and required phase inspections. And those actions just might prevent some major accidents. ★

Tech topics

briefs for maintenance techs

torque it, durn it!

Immediately after takeoff, a C-7 lost torque on the Nr 2 engine. The pilot shut the engine down and took the airplane back to the hangar. There the maintenance types discovered a loose valve adjustment nut on the Nr 1 cylinder. Since there was no record of local maintenance on that cylinder, there was no way of knowing who failed to properly torque the nut.

help maintenance help you

There was a time when it was easier for a pilot to tell the crew chief about some of the small things that required fixing than it was to write them up. That was in days long past, when the pilot flew the same aircraft every day, and he met the same crew chief every time he flew. Today it's different. The pilot usually flies a different aircraft every time out. Even if he should happen to draw the same bird two times in a row, his chances of being launched by the same crew chief are slim. So now if you notice a minor discrepancy that you feel should be fixed, your only recourse is to write it up. If you tell the crew chief, you may be telling someone who was assigned to the aircraft for one day only, or even if he is the regular crew chief, he might break his leg on the way home, so he goes to the hospital with the discrepancy you told him about still in his head.



The next day your buddy goes out to fly the same bird. Of course, a different crew chief launches him, and neither one knows anything about the loose instrument shroud you told the old crew chief about. Your buddy is now cruising along and he decides to make a seat adjustment. In so doing he places his hand on the instrument shroud for support. The shroud then comes all the way loose and pulls the firewall shutoff for Nr 1 engine. Now your friend is suddenly flying on one engine—primarily because you didn't write it up.

The importance of making a complete write-up with all details is obvious. Include everything that happened before, during and after the problem appeared. This you should do, even if you intend to brief the maintenance crew, because any number of things could happen to you or to the maintenance people you talk to before the man who actually does the work arrives at the aircraft.

The point is *write it up* no matter how minor it may seem and *give all the details* so that the man who comes to fix it will know as much as you do about the discrepancy.

sloppy maintenance

Shortly after takeoff, the T-37 pilot found that he could not retard the left throttle past 80 percent. He declared an emergency and accomplished a modified pattern with speed brakes and flaps to control the air speed. The left engine was shut down in the flare using the fuel shut off T-handle. When maintenance got the bird back, they found that safety wire was not installed on the ball joint jam nut (Ref. TO 1T-37-567 Fig 18) allowing the jam nut to back off and the throttle linkage to disconnect. The last work done on the throttle linkage was for a stiff throttle. This is not really the way to fix a stiff throttle, is it?

clamp woes



While turning base after completing an FCF, the pilot of an F-106 detected a faint odor of fuel fumes. Then, during landing roll, he was advised by the tower that the right gear appeared to be smoking. What appeared to be smoke was apparently vaporized fuel draining from a ruptured fuel line. As the aircraft parked, a large stream of fuel poured from the engine bay area in the vicinity of the tail hook attach fitting.

Investigation revealed that the high pressure teflon/woven wire fuel line had chafed through. The line runs from the bottom of the fuel filter to the left side of the fuel pump. The prime suspect for hose chafing is improper clamping. Don't underestimate the importance of clamping—use the right clamp and install it properly.

follow the TO



If it is necessary to park your bird tail-to-tail with another, be sure you follow the TO for distance and snubbing of controls. He might start up. Of course, the more distance you can put between you and the aircraft behind you the better off you are, as the people in the following incident found out the hard way.

A C-130, parked 535 feet from, and tailed to, another C-130 was performing an engine operational check. The crew chief of the bird that was *catching* the blast noted his aircraft bouncing around, so on the advice of the flight line expediter, wrapped a 5000 pound tie down strap around the copilot's rudder pedals and the right side of the copilot's yoke. Soon the right arm of the copilot's yoke failed at a point midway between the hub and the interphone button.

Inspection of the break area indicated a previous crack. Snubbing the controls in this manner is prohibited by C-130 maintenance TOs. TO 1C-130B-1, page 2-39, Fig. 2-4 states, "At 500 feet with engines at full power prop blast equals approximately 30 knots"—a good size breeze. However, the normal built-in hydraulic aircraft snubbers will do the job better than trying to tie the controls together in the cockpit.

MORE

Tech topics



wet feet

A C-123 at the beginning of his takeoff roll started drifting to the left of centerline, but was brought back toward the center with nose wheel steering. Transition from nose wheel steering to rudder was done at 50-55 knots. At about 60 to 65 knots the aircraft started veering to the left again. The pilot tried to correct but when it became inevitable that the aircraft would leave the runway, power was retarded to idle. The aircraft went off the side at the 1033 foot mark, and the left tire failed, followed by the nose gear failing and tucking under. The aircraft came to rest in a marsh—two feet of water. The crew plus two passengers departed the aircraft and one of the passengers received minor injuries.

It was determined that this joy ride was caused by maintenance. During the last phase inspection, card number 161, item one, had not been completely complied with. The card calls for removal, disassembly, lubrication, reassembly, and reinstallation of the nose wheel centering cartridge. But the cartridge had been removed and washed without disassembly, then reinstalled. Furthermore, during installation, proper adjustments were not made.

This is one of those cases where it is very easy to reflect and say, for instance, if the pilot had used proper technique he could have avoided the accident. However, the fact is, if maintenance had done their job correctly, the situation would never have developed in the first place.

more on torque

The T-38 was Lead of a two ship flight on a night instructor pilot trainee mission. On the go during the seventh touch and go landing, as both throttles were advanced to military power—BANG! The front seat IP took over, selecting max afterburner on both engines. The liftoff was continued, but an attempt to raise the gear was unsuccessful. The fire warning lights came on for both engines. The wing man reported, "It appears you have a fire." The IP was able to attain about 1000 feet and 180 KIAS, but the flight controls became sluggish and unresponsive. Both pilots successfully ejected below 500 feet.

The wreckage gave up a couple of clues as to what had caused the BANG and ensuing fire: (1) a "B" nut on hose assembly, PN R1007-P40163A5, of the variable guide vane actuator fuel inlet port, Nr 1 engine, was not properly torqued; (2) the leaking fuel was ignited when a first stage compressor blade failed. The resulting fire was intense enough to cause failure of critical flight control components. The engine failure by itself would not have caused any control problems, but the loose "B" nut provided fuel for fire, and we lost another aircraft because of improper torque.

don't toss it

If you are going to toss equipment around near a running jet engine, you'd best be prepared for the engine to swallow some or all of it.

While an F-100 was preparing to taxi for takeoff, the pilot displayed his two cockpit pins to ground personnel and motioned for them to pull the nose gear and tail hook pins. After removing the two pins, the ground man threw the pins to the pilot. (The ladder was not used because it didn't fit properly. The base only had one ladder for F-100s and it was being used at a location across the field.) The first pin tossed was caught by the pilot; however, the second was sucked forward out of the pilot's reach and ended up in the engine intake. The point is, if you are ever caught in a similar situation, plan ahead how you're going to get the pins to the pilot. A tote sack or some other method might work but don't toss them.



spit run

If you are not a recip engine mechanic, you most likely do not know what the term *spit run* means. If you are a recip engine mechanic, you know the term and the associated dangers if it is not done properly. The following incident is a prime example of what can happen when you try to cut corners.

The newly installed number two engine on a T-29 had been prepared for a depreservation run. Tech data had been followed with the exception of installing the depreservation drain plug hoses. It is impossible to install the drain hoses with the lower cowling installed. The engine was started, using the primer, and ran for 10-15 seconds, when a fire was noted. The operator attempted to blow out the fire by advancing the throttle; however, 700 RPM was all he could attain, so he released the primer but kept the engine rotating with the starter. The fire was extinguished by firemen and the damage was confined to the external part of the engine.

The fire was caused by an accumulation of fuel and corrosion preventive compound that puddled in the lower cowling from the lower cylinders. It probably ignited from a spark plug lead, even though the leads had plastic covers. It is believed that the spark jumped around the plastic to the ground. This outfit has decided to remove the lower cowling and install the drain hoses before spit running any more engines. In addition, they recommend metal caps on the loose spark plug leads rather than plastic. This would prevent any spark from jumping. Following tech data is still the best way to prevent such mishaps.

dangerous cargo



During offload of cargo from a C-5, the cargo deck non-skid material at approximately fuselage station 780 (left side pallet position) was noted to be raised and discolored white. It was determined that the discoloration was caused by liquid leaking from one of the pallets. The unidentified liquid had run into cargo tie-down fitting sockets and had trickled rearward in the roller conveyer channels and the guide rail channel. A loadmaster who felt and smelled the liquid said it was similar to photographic developing solution. To correct the problem the cargo floor was washed and mopped prior to the aircraft proceeding to its home station, where the affected area was washed with a water and soda solution.

A few days later the aircraft entered an isochronal inspection, at which time surface corrosion between fuselage station 700 and 1240 was discovered. SMAMA technical personnel were asked to determine the extent of damage and corrective action necessary. They determined the liquid to be sulphuric acid, and that it had damaged the main cargo area and the lower crawl area. Inspection and repair time was estimated at 800 manhours.

Lessons to be learned here are: (1) know the type of cargo you're carrying (this crew was unaware that they were carrying anything of a corrosive nature); (2) be sure AFM 71-4 is complied with; (3) should *any* liquid be spilled, identify and clean it up properly before further flight. Also be sure the spill and all clean-up actions taken are entered in the AFTO 781-A forms. Superficial identification in the first place delayed neutralization action in the second, increased the amount of damage considerably, and could have created a safety of flight hazard. ★

AGE--REPAIR OR REPLACE IT?

Frank C. Espiritu, SAAMA, Kelly AFB, Texas

Is your repair of aerospace ground equipment (AGE) based on the 65 percent repair criterion cited in Air Force Manual 67-1? Are you expending a large quantity of man-hours in maintaining your equipment? Does your organization have a low AGE in-commission rate? If the answer to any of these questions is yes, then you apparently have not heard of Air Force Regulation 66-31, Technical Order 00-25-240 or TOs 35-1-24, -25 and -26. These documents contain the philosophy and criteria as well as the guidelines for determining one-time repair expenditure limits for AGE.

These directives came about because, in years past, AGE was bought for specific weapons systems on the premise that it would phase out with the aircraft. But, it just didn't work that way. Unless the item became totally obsolete, or completely worn out, we kept it and repairs frequently exceeded its worth.

Finally, based on a study by SAAMA (MMR), Hq USAF published AFR 66-31, "Uniform Repair/Replacement Criteria for Air Force Aerospace Ground Equipment," dated 2 June 1969. This was followed by TO 00-25-240, 25 August 1969, after which each AMA managing AGE published technical orders as follows:

- SAAMA—TO 35-1-24, "Air Force Economic Repair/Replacement Criteria for Selected SAAMA Managed Aerospace Ground Equipment," dated 30 December 1969. This technical order applies to AGE managed by SAAMA in Federal Stock Classes 1710, 1730, 1740, 2835YZ, 3655, 4120, 4910, 4920, 4930, 4940, 6125 and 6130.
- WRAMA—TO 35-1-25, dated 1 September 1969. It applies to AGE managed by WRAMA in Federal Stock Classes 4310, 4320, 4520 and 4610.
- SMAMA—TO 35-1-26, dated 1 November 1969, which applies to AGE managed by SMAMA in Federal Stock Class 6115.

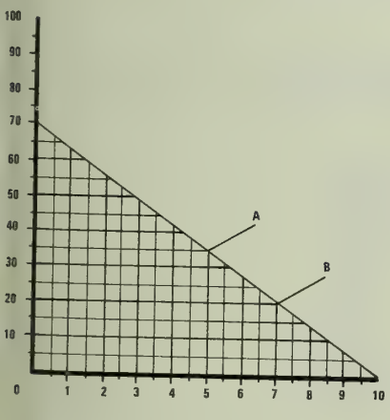
The Air Force Uniform Repair/Replacement criteria are intended to cause a decision at the time an item of equipment is in need of repair and are based on the following elements: service life, maximum allowable one-time repair expenditure limit, equipment age, replacement cost and repair cost estimate.

The service life and maximum allowable one-time repair expenditure limits are established by the AFLC activity having item management responsibility for the equipment, based on age of the equipment and its unit cost. The activity possessing the equipment prepares the repair cost estimate based on the required maintenance.

All AGE does not require the same amount of surveillance; therefore, for the purpose of applying the economic repair criteria, AGE has been divided into the following categories:

• High dollar aerospace ground equipment which costs $2,500 or more. These items are assigned maximum allowable one-time repair expenditure limits and estimated service life. They are listed in TOs 35-1-24, 35-1-25 and 35-1-26 by FSC, P/N and Noun in a convenient table citing the repair expenditure limit for each year of the estimated service life of each item.





arts similar to this are used by ch AMA to compute repair expenditure limits.

When the repair cost estimate for AGE in this cost category exceeds the maximum allowable one-time repair expenditure limit, the owner must submit to the FSC IM a detailed description of the deficiencies and a detailed repair cost estimate on AFTO Form 375, "Aerospace Ground Equipment Repair Cost Estimate."

• Middle dollar AGE which consists of items costing $200 or more but less than $2,500. These items are listed in the technical orders by FSC, P/N and Noun, with a table showing the repair expenditure limit. When the repair cost estimate for AGE in this category exceeds the one-time repair expenditure limit, the owner will advise the FSC IM. However, submission of a detailed description of the deficiencies and a repair cost estimate are not required. The FSC IM will advise the possessing organization whether the item will be replaced or repaired.

• Low dollar AGE which consists of items costing less than $200. These items are not identified in the technical order. AGE in this cost category will be repaired if the repair cost is less than 50 percent of the replacement cost. Notify the FSC IM of disposal action by letter in accordance with AFM 67-1.

The senior maintenance officer at a specific activity may authorize repairs of equipment without prior FSC IM approval, provided a mission essential requirement exists for the item, but he must be prepared to fully justify and support his action to higher headquarters.

The FSC IM will determine if items should be replaced or repaired and will so notify the submitter within three days.

Activities at all levels concerned with maintenance of AGE should insure that all personnel become thoroughly familiar with the new responsibilities and procedures delineated in AFR 66-31, TOs 00-25-240, 35-1-24, 35-1-25 and 35-1-26. ★



NUCLEAR SAFETY AID STATION



COLES CRANE BOOM

Subsequent to a reentry vehicle (RV) mating operation, an inspection of the Coles Crane Boom was conducted and several cracks were found in the welds of the inner boom section. Another Coles Crane was inspected and several cracks were found on the welds in the same location. Repair procedures and technical assistance were immediately furnished by the depot. A follow-on X-ray inspection of the boom sections was performed on the same two cranes and numerous other cracks were found. The cracks which were not visible without the use of X-ray were in various stages of propagation, and ranged in length from one-half to three inches. The importance of strict compliance with inspection procedures specified in TO 33D4-2-43-1 for L-3010 Coles Cranes cannot be overemphasized. The consequences of handling nuclear munitions with defective or unsafe handling equipment can be serious. The true professional will always take time to ensure that Aerospace Ground Equipment is in A-1 condition prior to use in nuclear weapon operations.



SOMEBODY GOOFED!

A recycle team discovered a damaged Minuteman lightweight spacer with three cracks propagating radially from a point on the spacer. Several other smaller areas of damage were observed. Using instructions from the depot, the reentry vehicle (RV) and spacer were removed without incurring further damage. A job well done. Investigation showed that the spacer bottom correctly fitted gouge marks on the Pen Aid rim. Additionally, a broken stud lined up with another gouge which included thread marks. That old enemy of nuclear safety, "Personnel Error," was evident. The Missile Maintenance Team (MMT) probably lowered the RV onto the Pen Aid in a misaligned position. When the weight of the RV settled, this caused the damage.

MMT personnel have been briefed on this nuclear safety deficiency. An examination of MMT training procedures to determine quality and sufficiency of training given is being accomplished. A request for a special training session for all MMT personnel to include hazards and proper procedures during RV mate/demate is being submitted. In the interim, are you certain your procedures are safe enough to prevent this type deficiency? ★



SLIPPING CLUTCH

A convoy was enroute from a launch facility to the Strategic Missile Support Base (SMSB). The reentry vehicle, guidance and control (RV/G&C) van was stopped because the tractor clutch was slipping. A national defense area was established, and the vice wing commander and the wing director of safety were to the scene. Another tractor was dispatched and was used to return the RV/G&C van to the SMSB. The cause of slippage was not determined by the base motor pool. Why not? Is your vehicle being maintained in proper running condition? Is your motor pool maintenance team really doing a good job? If not, let somebody know about it.

Toots

is interested in your problems. She spends her time researching questions about Tech Orders and directives. Write her c/o Editor (IGDSEA), Dep IG for Insp & Safety, Norton AFB CA 92409



Dear Toots

After much discussion locally, I've decided to write you about one aspect of a maintenance officer downgrading a red X. Specifically, whose name is entered in the "Discovered By" block when the downgraded entry is reentered in the first open block in the 781A?

TO 00-20-1 paragraph 3-24 is so vague on this matter that no mention is made of the "Discovered By" block.

1st Lt John J. Weber, Jr.
320 OMS
Mather AFB, Calif.

Dear John

In order to answer your question about paragraph 3-24, TO 00-20-1, I called the OPR for information. They said the correct way would be to print the name of the individual who made the original entry in the "Discovered By" block where the original discrepancy has been reentered. They also said that 00-20-1 is in the process of being rewritten. A note was made to change paragraph 3-24 when they get that far. However, I suggest you submit an AFTO 22 just in case they lose their notes.

Toots

Dear Toots

Recently a question was brought up on making pen and ink changes to technical orders. In TO 00-5-1 it states that "issuing instructions requiring activities to make pen and ink changes to the technical content of technical orders is unauthorized." However, we have recently received instructions to make pen and ink changes to TO 1T-38A-6WC-2, -4, and IT-37B-6WC-4. These changes were arrived at during a maintenance management review conference.

My question is who has the authority to make pen and ink changes to tech orders and at what staff level?

Sgt George D. Goodson
3550 Fld Maint Sq
Moody AFB, GA 31601

Dear George

I wrote to the OPR for TO 00-5-1 and they, in turn, queried SAAMA, the SM for the T-37 and T-38 aircraft. SAAMA states that no instructions were issued by them during the T-37/T-38 MMR Conference to make pen and ink changes to TOs 1T-38A-6WC-2, -4 or 1T-37B-6WC-4. On the contrary, the MMR attendees were advised that changes to technical orders (workcards) would be distributed within the 106 day limit outlined in AFLCM 66-20. In short, the T.O. is correct.

It appears someone in your outfit misunderstood. Thanks for writing.

Toots

Ops topics



SUSPICIONS CONFIRMED

A couple of really valuable lessons can be learned from a recent incident in SEA. They aren't new lessons, by any means, but they'll bear repeating.

A C-123K was making a VFR approach to one of the larger airfields (runway length was no problem). The aircraft commander, an IP, was in the left seat. The copilot, making the landing from the right seat, flared abruptly and when the aircraft ballooned he wiped off all the power before the IP could stop him. The airplane descended smartly, and hit the runway hard enough to cause some concern on the part of the crew.

Lesson One: Quick reactions are the order of the day during training in critical phases of flight. Don't get behind the student!

After the landing, the crew inspected the gear and found no damage. That cursory inspection might have been a link in the chain of events leading to a major accident, except for the professional attitude of the IP. Despite the fact that their inspection disclosed no damage, he wrote the airplane up for a hard landing. A closer inspection by maintenance revealed a cracked nose gear oleo mounting flange.

Lesson Two: When in doubt, write it up! ★

OVER-WATER BAILOUT

In a recent over-water ejection a crewmember actuated only one of the two parachute riser releases upon entering the water. Water temperature was 41°F and the crewmember, well aware of the limited survival time at that temperature without an antiexposure suit, decided to board the life raft first, then disconnect the other riser. He became entangled in the suspension lines, however, and found it impossible to board his life raft because the canopy had become submerged. Had it not been for the presence of two local fishermen, whose efforts were severely hampered by the crewmember's entanglement, it's quite likely that the crewmember wouldn't have made it.

Procedures for parachute water landings are spelled out in TO 14D1-2-1.

"After the parachute opening at the preset altitude of 14,000 feet or below, the following instructions should be complied with:

1. Check the canopy.

2. Remove the oxygen mask or pressure helmet visor.

3. Actuate the release on the survival kit to inflate the life raft.

4. Check to insure the raft has inflated properly. If the raft has not inflated properly, and time permits, the raft can be pulled up and complete inflation can be accomplished orally.

5. Inflate the underarm life preserver by pulling sharply downward and slightly outward on the lanyards extending from the lower front corner of each container. If a failure occurs, the life preserver can be orally inflated prior to entry into the water, thereby reducing possible confusion after the water entry.

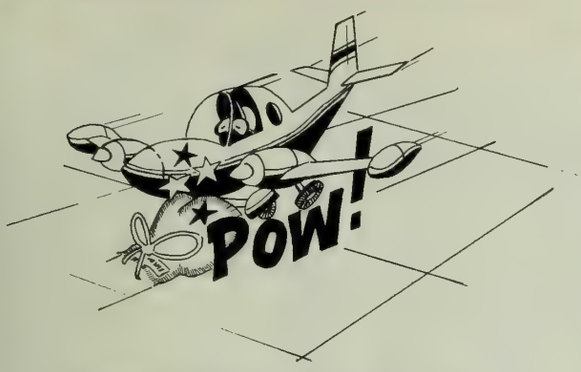
6. Connect the inflated cells together with the Velcro straps provided. If individual preference indicates the raft can be boarded easier with the cells disconnected, connect cells after boarding raft.

WARNING: When your feet touch the water, immediately operate canopy releases to spill the parachute. In any water landing, altitude is difficult to determine. *Do not* release the canopy until the feet touch the water, no matter how close you think you are.

After a water landing, entanglement in the suspension lines is a possibility. It is recommended the canopy be discarded, rather than retained as in the past.

The foregoing procedures should be used day or night after bailout over water or over land where the possibility exists of drifting over water or where position is uncertain." ★

The GUNFIGHTERS of the 366th TFW are having their SECOND PRACTICE REUNION for all officer members in Tampa, Fla., 30 April-2 May 1971. All members, past and present, are requested to write for details and to submit their address to: GUNFIGHTERS, Box 6586, MacDill AFB, Fla. 33608.



AERO CLUB TRAINING

An Aero Club student pilot, out solo, dinged his trainer when the runway came up unexpectedly and smacked the airplane. The airplane subsequently entered a porpoise, helped along a little by out-of-phase control movements by the student trying to salvage the landing instead of going around for another try, and slid to a stop minus the nosewheel.

One additional finding by the investigator centered around the fact that this club, in accordance with Federal Air Regulations, permits students to solo in more than one type of aircraft. Most Commands now urge their aero clubs to pick a trainer and stick to it. This makes real sense. A reasonably aggressive student can win his private license in about five months, and there's plenty of time after that for him to broaden his horizons in other types of aircraft. It makes little sense to add the problems of dual currency to the multitude of problems the low-time pilot already has to cope with. ★

FLIP CHANGES

DD-175: The location identifier, if assigned, will be used in the destination block (e.g., KSKF vice Kelly AFB) to facilitate computer processing of flight plans. (Section II, FLIP Planning, N&S America and Pacific editions.)

Airport Traffic Area: The vertical limits of an airport traffic area are now up to but not including 3000 feet above the airport elevation (Special Notice, Section II, FLIP Planning).

FLIP Planning: Section IV of FLIP Planning has been deleted. Users should remove Section IV and the accompanying separator. (Special Notice, March issues of the IFR-S.)

ARTC Radar: "Radar Contact" will not normally be reported to the pilot when he is handed off to another controller after radar contact has once been established (IFR-S), Pilot Procedures with ARTC Centers). ★

RECYCLE TRICYCLE MAY EQUAL BICYCLE

There's an ol' school of thought that says, "if you put the gear down and it indicates unsafe, you go through all sorts of procedures to get it down and safe. Once you do, *don't* touch anything, just land!" Maybe there were some conditions we don't know about but a recent incident tells us that everyone doesn't adhere to this policy.

After a number of TAGs the gear down resulted in an unsafe left main. The pilot pulled the emergency "T" handle and the left gear immediately indicated down and locked. Suspecting a bad sequencing valve he recycled the gear. With the gear handle up, the red light in the handle stayed on. The landing gear circuit breakers were pulled to determine if all gears were up and locked. The gear stayed up and the red light stayed on. The control tower verified the left main gear door was open. The gear was lowered normally and all gear indicated safe. The aircraft was landed without incident. But it seems to us that trouble shooting a gear problem should be done on jacks not on downwind. ★

P-47 THUNDERBOLT
PILOTS ASSOCIATION
10TH ANNUAL REUNION
ANTLERS PLAZA HOTEL
COLORADO SPRINGS
COLORADO
MAY 1, 2, 3, 4, 1971

For Information Contact:
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DECEMBER ASM

While looking for something to read the other night I came across a relatively unused copy of *Aerospace Safety* (Dec 70 issue). Being a private pilot I began to thumb through the copy and stopped on the article, "What's A Left Downwind?" Needless to say, I was horrified at the thought that this so called "private pilot" did not know what he was doing. Several other persons in this shop commented on that particular article (also in the "private pilot" category). Your magazine had quite a few miles put on it before the circulation stopped.

You might be pleasantly surprised to know that the men in this shop are not maintenance types. We are, in fact, "intel people" and of course interested in our aircrews. The December issue pointed up some very interesting highlights of AF flying, and gave quite a few of us a better understanding of what problems pilots can encounter.

One specific point was noted by several of us "pilots." The cover photo by Kenneth L. Hackman (Aerospace Audio Visual Service) was absolutely fantastic. Would it be possible for us to obtain or purchase a copy of the photo that adorned the cover of the December issue?

Although not on distribution for your magazine we will undoubtedly "hunt" copies as they become available. *Aerospace Safety* has provided a somewhat better understanding to us non-maintenance types, of what goes on behind the scenes of Air Force flying, and Air Force safety.

SSgt Richard R. Pelech
460 Tac Recon Wg
APO San Francisco 96201

Thanks, Dick. We'll try to get a copy of the photo for you.

PORTABLE NOSE DOCKS

I was just reading through your January issue and noticed the article on page 29 about portable nose docks at Ubon RTAFB, Thailand.

I would like to point out that Ubon is not the only base in SEA to have portable nose docks. Korat has had them for well over a year and has had much success with them in preventing the forward area of the aircraft from getting wet in rainy weather. The portable nose docks at Ubon look quite similar to those at Korat (wonder if they stole the idea from Korat?).

I would like to take this opportunity also to congratulate you on a really fine publication; it's really a pleasure to sit down and take a few minutes to read over all the interesting articles that you have every month. The magazine really helps out the maintenance troops a lot in looking over their areas and checking to see if they can eliminate any problems that have been written about in your articles.

Keep up the good work and we here all are awaiting your next issue of *Aerospace Safety*.

TSgt John P. Breese
460 FIS
Kingsley Field, Ore.

"PROJECT CLEAN SWEEP"

Kudos to the 307th FMS at U-Tapao in their "Project Clean-sweep." The concentrated five day maintenance attack appears to be an excellent program to keep the high altitude bomber force in combat ready posture. However, I could not help but notice the picture of Sgt L. J. Smith, standing on the engine nacelle of a B-52, engaged in a spray painting operation without the use of some sort of protective face mask. It's great to repaint your aircraft, but why your lungs?

Maj Thomas D. Miller
Director of Safety
4454 CCTS
Davis-Monthan AFB, Ariz.

Wish we could say we were just checking to see who's alert.

☆ U.S. GOVERNMENT PRINTING OFFICE 1971 431-463/8

UNITED STATES AIR FORCE

WELL DONE AWARD

Presented for outstanding airmanship and professional performance during a hazardous situation and for a significant contribution to the United States Air Force Accident Prevention Program.

Major
DONALD L. HEDRICK
318th Fighter Interceptor Squadron, McChord AFB, Washington



Major Hedrick was scheduled to fly a functional ght check in an F-106A. All pre-takeoff and power ecks were completed satisfactorily. The takeoff roll s uneventful until liftoff, at which time the aircraft nt into a 20 degree right bank. Full left elevon and t elevon trim would not level the wings. The right ng was extremely low and aft stick pressure was re- ired to keep the wing from striking the ground. With combination of left rudder and aft stick pressure, ajor Hedrick flew the aircraft in a climbing right rn to a safe altitude. As airspeed increased, right bank increased; however at 185 knots the aircraft could be held wings level with left stick pressure and left rudder. A straight in approach was flown, and the landing was made without any directional control problems, after the main gear was on the runway.

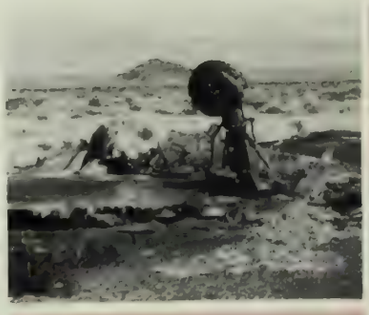
This malfunction of the flight controls was caused by the right Hydraulic Elevon Package (HEP) valve not maintaining the pre-adjusted neutral position. Major Hedrick's timely applications of correct flight control inputs in proximity to the ground saved not only his own life but a valuable aircraft. WELL DONE! ★

running is great

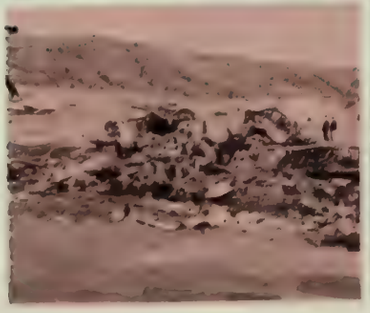


but
rushing
leads to
accidents











UNITED STATES AIR FORCE • MAY 1971

Aerospace SAFETY





COVER PHOTOGRAPH BY S. J. TANNHEIMER, AEROSPACE AUDIO VISUAL SERVICE.

UNITED STATES AIR FORCE

Aerospace SAFETY

MAY 19

FOR AIRCREWS, MAINTENANCE & SUPPORT TECHNICIANS

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WELL DONE

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MAY 1971 AFRP 127-2 VOLUME 27 NUMBER 5

the family tree



Lt Col George D. Akins
Hq Alaskan Air Command

After a few months riding the circuits, an inspector becomes aware of looking forward with pleasure to returning to certain stations—and looking forward with some displeasure about returning to others.

Since they are all "remote," and since a different set of people is there each time he arrives, what makes one station consistently "good," and another consistently "not so good"?

We are convinced the answer is good "character," built over the years by people who care about what they leave behind.

Sitting in the mess hall at one of the remote stations, and gazing around at the milling, munching crowd, a new inspector remarked that one year from then (when he got back to this station) all those faces would be gone and a new generation would have taken their place—still milling and munching.

The remark provoked thoughts and dialogue through several beers that night: "A new generation born, matured and gone each 12 months;" "a whole life span packaged in a 365-day capsule;" "the continuity of character on a family tree, or in the history of a remote station."

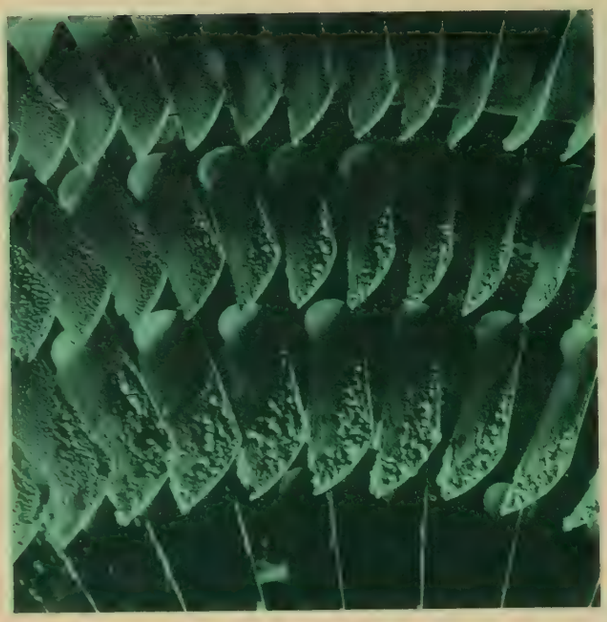
Without getting too far out about the whole thing, try comparing a station to an old, established family in your home town. Each generation had a part in molding the special quality of that family's reputation and character.

As a member of a family (and as a member of a station), whether he wishes to or not, a man contributes something to the next "generation." A marginal Civil Engineer or Supply function can almost inevitably be traced back on the family tree to a bad apple who begat the bad seed—or to the one who "copped out" for a year, or the one who sat still and "cried" for 12 months.

The special environment of a "good station" is felt almost at once by the visitor; little things that add up to a very tangible character. Their receptions are sincere and friendly—not phony and suspicious; their clubs are warm, comfortable and alive—not cold, awkward and dismal; the mess halls somehow manage to produce a few "goodies" above the standard fare for their troops; conduct of business is confident and easy, not desperate and confused.

There's one thing about good, solid character—if there are enough people who have it, it gets rubbed off and passed on, and it grows and permeates: somewhere down the line the "good" families and stations had enough character in one generation to get the ball rolling.

How's your family's character today? What are you doing about it? What are you going to leave for the next generation to build on? ★



Smart operating procedures and good engine maintenance are the best anti-perspirants for the salt encrustation problem.

A SALTY SITUATION

L. E. GOODDING
General Electric Co., Lynn, Mass.

Salt air may invigorate the mind, clear the sinuses—even cure arthritis. But, to a turbojet or turboshaft engine the same exposure can hardly be classified as therapeutic. The relationship of salt air to metal corrosion is well known and caution notes abound in tech data.

Less well understood, and sometimes ignored, is the tendency for salt build-up on engine compressor vanes and blades to rob the engine of its normal power potential and its compressor stall margin. To the helicopter pilot hovering just above the ocean, the subject should be of more than academic interest—reading and responding to engine operating symptoms can avoid possible engine malfunction and keep the powder dry.

The following material was drawn from T-58 engine testing and field experience. Although certain characteristics may be unique to this engine, most of the information is pertinent to all gas turbine engines and is worthy of review by other than just the H-1 and H-3 operators.

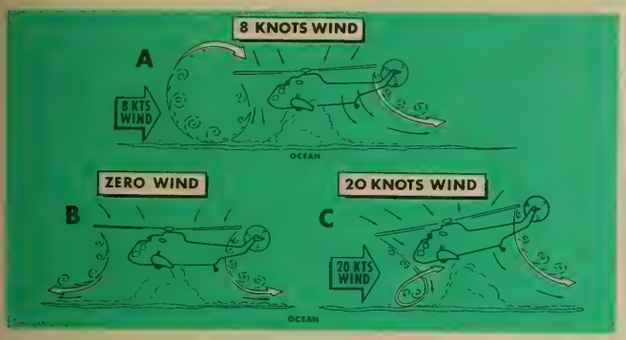
Salt moisture particles or droplets entering a turboshaft engine are typically measured in parts-per-million by ratio with the incoming air. However, an air-breathing engine consumes very large quantities of air while doing its thing; as an example, the relatively small T-58 engine ingests 12-14 pounds of air per second, the T-64 devours 28 pounds per second. Under the right conditions, this big appetite results in a rapid build-up of salt crystals on compressor components.

In the forward stages, the high air velocities quickly evaporate the water from the salt. In the aft stages, the heat of compression is sufficient to boil away any remaining liquid water particles. Heaviest concentrations appear in the early stages, as evidenced by the photo above, but deposits need not be that severe to have operational repercussions. The salt deposits play havoc with compressor airflow and efficiency. The smooth and shiny blade/vane surfaces are now coated with rough deposits—the engine runs hotter. Power and stall margin decrease at a substantial rate.

Extensive helicopter testing has provided important background regarding the many variables that contribute to the salt encrustation rate and the corresponding "safe" time that can be expected at a given hover height. The downwash from the helicopter rotor system creates a frothy ring or *torus* of agitated sea water around the entire aircraft. This air velocity causes salt particles to become airborne. With conditions at the worst, this salt spray is swept forward and upward directly into the engine inlet. To the Rescue/ASW

pilot the explanation should pose no surprise; windshield wipers must often be used to improve visibility in this machine-made mist. Conditions are comparable up to the mezzanine where the engines are operating.

At first blush it would appear simple to develop hover time limits at various altitudes based on some acceptable power degradation level. Unfortunately, too many contributing variables are involved, among them salinity content, wind velocity/direction, sea state and



aircraft attitude. As the figure above illustrates, wind conditions are particularly significant. At zero wind, most of the spray is blown away from the aircraft. At 20 knots the spray blows aft, beneath the aircraft. With an 8-10 knot headwind (and a low hover height), conditions approach the intolerable—the engine inlet is engulfed in salt spray.

Hover height is particularly critical in determining the salt deposit rate. Figure 1 defines power deterioration rate versus hover height under adverse wind and sea state conditions. Below ten feet, a very tall chart is required to contain the data points on the paper. For T-58 powered helicopters the rotor downwash ceases to be a major factor above 40 feet. With larger rotor systems such as exist on the H-53, the equivalent level might occur at approximately 70 feet.

The loss of power potential during over-ocean hover can be better appreciated by monitoring engine instruments as the hover continues. As salt build-up progresses, the engine must steadily increase gas generator speed (N_g) and power turbine inlet temperature (T_5) to maintain the constant power demands. Less obvious to the experienced helo pedal pusher is the corresponding decrease in compressor stall margin which accompanies the salt encrustation process. On the adjacent chart the stall area is depicted as a large black cloud. Continued salt air ingestion causes the stall region to move closer to the engine operating line. If the stall area actually intersects the operating line there may be a series of pops and/or an immediate loss of power unless, in the popping process, the compressor sheds some of the salt

POWER DETERIORATION RATES VS HOVER HEIGHT ABOVE SALT WATER*

RATES STRONGLY INFLUENCED BY PREVAILING WIND AND SEA STATE CONDITIONS.

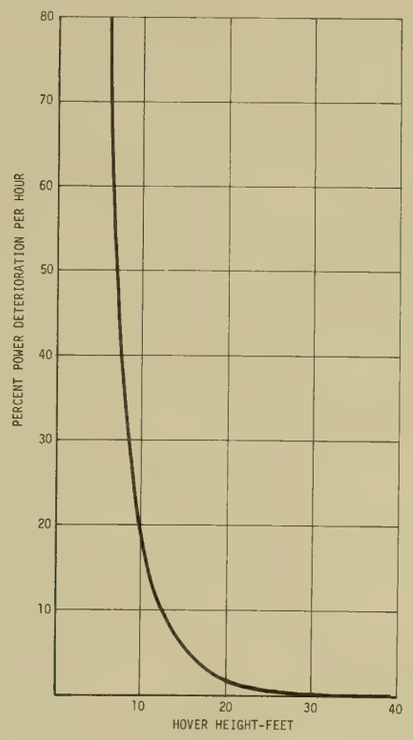
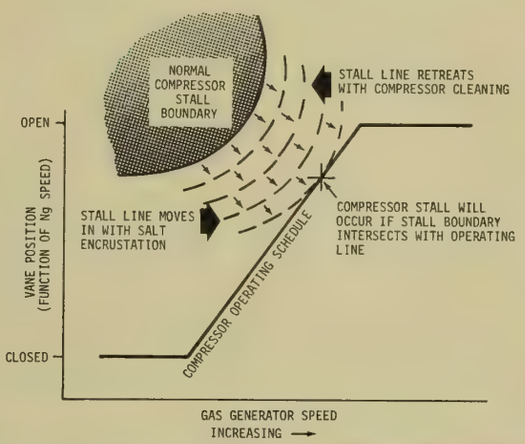


FIGURE 1

*DATA FOR COMPARATIVE PURPOSES ONLY - NOT TO BE USED AS LIMITS FOR DETERMINING SAFE TIME IN HOVER CONDITION.

EFFECT OF SALT INGESTION ON LOSS OF COMPRESSOR STALL MARGIN



deposits and regains a portion of lost stall margin. A sudden deceleration or down collective can further aggravate stall possibilities. Where substantial power deterioration has already occurred, the best operating policy is to leave the hover area using slow, even changes of power.

A SALTY SITUATION

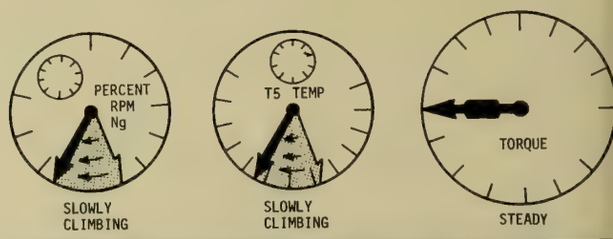
In the case of multi-engine aircraft, stall could conceivably occur almost simultaneously on all engines. Therefore, monitoring for power degradation is particularly important to mission reliability. Even where stall may not be a factor, the reduction in overall engine power potential downgrades capability in the event of an engine-out emergency.

OPERATING TIPS

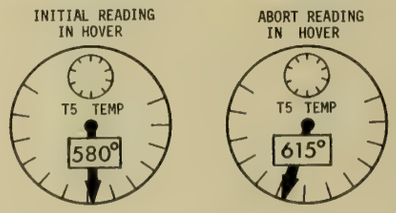
The pilot is equipped with adequate instrumentation and the engine provides sufficient symptoms to allow recognition of excessive power degradation. At a fixed torque, N_g and T_5 will continue to rise as the salt build-up process continues. Armed with this information, the pilot can exercise effective precautions.

1. For T-58 engines with adequate stall margin, an increase of 35°C can be tolerated at a fixed torque before a hover abort need be considered. The compressor should be washed prior to the next flight.
2. Preferably, the T_5 and torque (Q) should be recorded upon entering the hover. If for any reason, speed selectors are manipulated or load changes applied, periodic checks should be made by re-establishing the original torque on each engine and determining the T_5 rise.
3. When the stall margin of a T-58 is not known by periodic maintenance check or the compressor is partially fouled with exhaust products, a T_5 temperature rise at 20°C (at constant torque) should be selected as the hover abort limit.
4. Flying through rain showers may regain a portion of lost power and stall margin. This approach is *not* an adequate substitute for the prescribed compressor cleaning procedure, however.
5. Rapid deterioration can be expected whenever heavy deposits of spray strike the windshield.
6. Installation of an EAPS or FOD deflector system reduces salt build-up rate and allows longer periods of hover near the ocean surface.
7. In instances of substantial power degradation, the speed selectors and the collective stick should be moved with discretion. Quick movements of either system increases the chance of stall.
8. Unless the mission demands continuous proximity to the water, increasing hover height will noticeably decrease salt build-up.

ENGINE CHARACTERISTICS IN A SUSTAINED HOVER OVER SALT WATER



MONITORING CHECK FOR EXCESSIVE T_5 RISE DURING HOVER - EXAMPLE



EXAMPLE

INITIAL READING	580°C
READING AFTER 'X' MINUTES IN HOVER	615°C
RISE IN T_5 AT SAME TORQUE	35°C

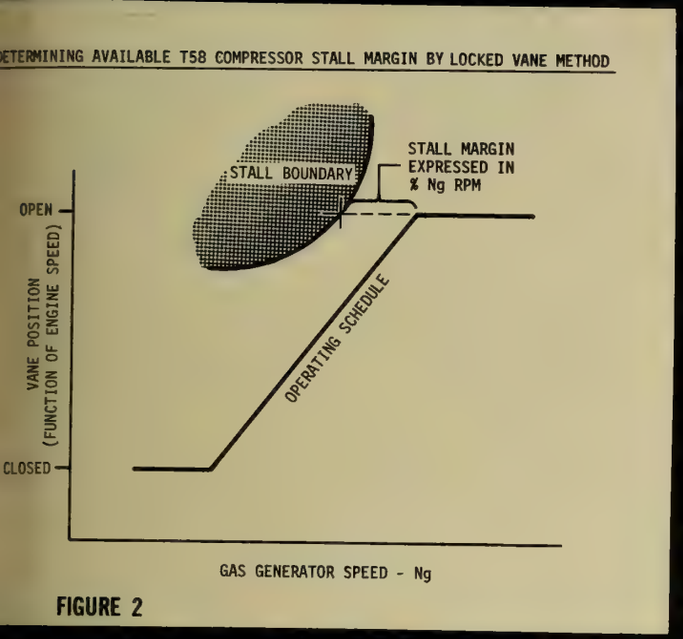


FIGURE 2

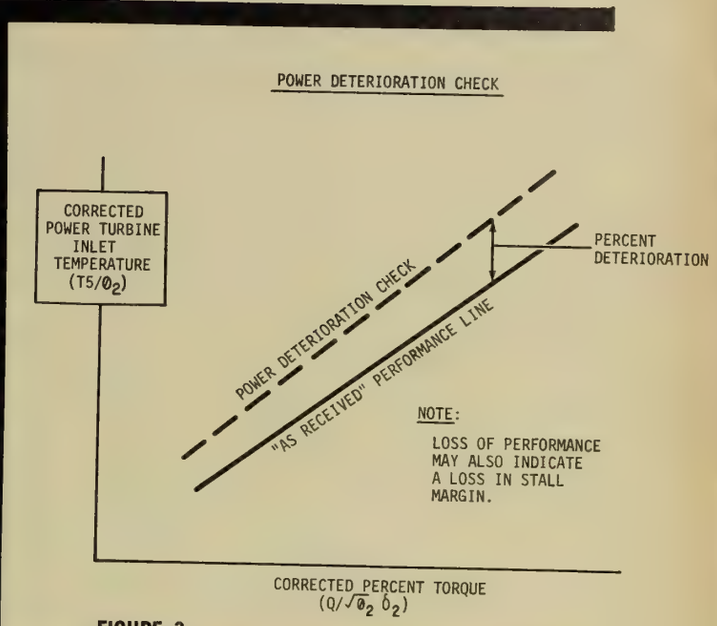


FIGURE 3

MAINTENANCE TIPS

For pilot precautions and monitoring procedures to be effective, maintenance personnel must issue a "good" engine from the JEIM shop and keep the compressor clean of all contaminants. Technical Orders define these various procedures. Certain USAF units will be equipped with AGE and instructions for conducting periodic T-58 compressor stall checks. Important steps include the following:

1. Conduct stall margin checks on all T-58 engines after JEIM repair. This check is performed by locking the variable stator vanes at a specified position and decreasing N_g speed slowly until the authorized limit is met or a stall occurs. See Figure 2.
2. Perform periodic stall checks in the aircraft (Mechanical Stall Checker) or power deterioration checks to detect possible compressor damage or fouling. Power deterioration checks compare actual performance to previous "as installed" values. As loss of stall margin normally accompanies a drop in performance, power checks can define serviceability in the same manner as a stall check. See Figure 3.
3. Wash compressors after each flight where a noticeable T_5 rise has occurred during hover.
4. Swear off stator vane tinkering to correct deficiencies elsewhere in the engine. A reduction in stall margin always results when vanes are adjusted in the open direction. When such adjustments are made, a stall margin check should follow.

The limits and procedures described above apply only to the T-58 engine. Other engines may display somewhat different characteristics with salt water ingestion. Generally, such information is included in the applicable operating and maintenance instructions.

It would be delightful if every helicopter were equipped with a console light or an audible warning system for crew alert when salt deposits exceed tolerable levels. Such a device may be available in the future. However, if the prescribed maintenance and T_5 monitoring practices are conscientiously followed, the device need not be a requirement.

In the words of the not-so-famous Eskimo poet and philosopher:

"He who fails to heed this primer,
Had better be an excellent swimmer." ★

AN
Aerospace
SAFETY
INTERVIEW

with COL ALBERT P. LOVELADY
Systems Program Director
Life Support Systems Program Office

life support for aircrews

During the past several years, marked improvements have been made in Air Force life support equipment. Technical advances undoubtedly have been a factor but two other developments exerted considerable influence. These were the war in Southeast Asia, which intensified the need for better life support gear and the creation in 1965 of the Life Support System Program Office (SPO) in System Command's Aeronautical Systems Division.

Since their lives depend upon the availability and quality of life support equipment, aircrews have always been extremely interested in this subject. Hence, the following interview with Colonel Albert P. Lovelady, director of the Life Support SPO, in which he discusses some of the goals and accomplishments of the SPO, describes improvements in current hardware and gives us a glimpse into the future.

AEROSPACE SAFETY: Col Lovelady, what have been the major accomplishments of the Life Support SPO (LSSPO) to date?

COLONEL LOVELADY: Probably the most significant thing—and the purpose for establishing the Life Support SPO—has been to establish a single agency responsible for all life support equipment. This is important because we finally have established a single manager, a focal point, for all life support development. As an example, several years ago, SAC needed a lap belt fix on some of its aircraft. In order to get it, they were forced to deal with five or six different agencies in both the Logistics Command and Systems Command. Today they need only to identify the requirement to the SPO, whose job it is then to coordinate whatever efforts are required to get the job done.

AEROSPACE SAFETY: Does this mean a different approach from the way we did things in the past? For example, in the development of new aircraft?

COLONEL LOVELADY: Yes it certainly does. Although we are really just emerging in this area, we have actively participated in the F-15, the B-1 and the AX development programs and have even modified and tailored many of our research and development efforts in their support. We are currently developing a new ejection seat intended for the F-15 as well as a new self-contained oxygen system for the B-1. We see our role as a consultant in Life Support, avail-



able to assist the major Weapons System Program Offices.

AEROSPACE SAFETY: What other new developments are there?

COLONEL LOVELADY: Many. New things keep coming along and of course we keep trying to improve present equipment. These are the more obvious and most publicized of our efforts. But, before we pass on to these, let me touch briefly on a very important but less noted accomplishment. As the Air Force focal point for all life support developments, we have been able to establish a close working relationship with the other services as well as NASA. As Air Force spokesman in the area of life support, we have been able to establish areas of common requirements and undertake joint programs to the mutual benefit of all services. It has permitted us to make maximum use of our research and development dollars. This is a very bright and promising development which is often overlooked.

AEROSPACE SAFETY: Now that there is better organization of the life support effort, what lies ahead? What are your major goals?

COLONEL LOVELADY: Well as you know, we have been kept busy putting out fires. But now we're ready to move ahead to a real systems approach. Something that is absolutely necessary and we're working on it now. Our first major goal is that of documenting for both the "user" as well as the designer, those requirements which describe a true system for life support. When this is accomplished, it will be in the form of a designers' handbook, available to all and in a format which can serve as a common basis for all.

This will enable us to determine in the initial design stage how much comfort we must provide the crew for best performance—how much space, the size of the seat. In other words, we think eventually that aircraft will be designed around the man and his requirements. We must continually keep the man uppermost in our minds.

AEROSPACE SAFETY: Colonel, we have a lot of survival training. How good is it in your estimation?

COLONEL LOVELADY: Survival training is not a responsibility of the Life Support SPO but we are very much dependent upon its success if the equipment we develop is to do its job. From this viewpoint, then I would answer: It is good and is continually improving. Major schools like the TAC SEA Survival School and the PACAF Jungle Survival School, I believe, are the best in the world. Certainly, we have frequently trained men in the wrong school or given them training they didn't need or that wasn't totally pertinent to their combat environment. But this area, like life support, is learning from past mistakes and I believe we will see a new philosophy emerge with the recent consolidation of all survival training within the Air Training Command. I think we're going to see some drastic changes where training will be better tailored to the needs of the individual commands to fit their mission.

AEROSPACE SAFETY: I wonder if we could get into some specific items that aircrews can look forward to?

COLONEL LOVELADY: Surely and there are a lot of them. Some they'll see very soon, some will take time. Let's start with flight clothing.

First, there's the Nomex family of fire resistant fabrics. The Nomex flight suit is in the field. Its life saving ability has already been graphically demonstrated in recent aircraft mishaps and although we've received a few complaints regarding its comfort in warm climates, it appears to be well accepted. We are working on the CWU-17/P jacket with Nomex shell and batting which is planned to replace the N-2B heavy and intermediate weight jackets. A new CWU-36 is planned to replace the present lightweight flight jacket. It will not have the orange liner but will carry an orange panel stowed within the inside pocket.

We have a new quick-don boot coming and we're also testing (in SEA) a Nomex sock and Nomex-leather jungle boot. The boot is an Army development and if our tests are successful, we will standardize on this item for hot climates. We are also testing a Nomex trouser and an intermediate weight coverall in anticipation of a possible command requirement.

AEROSPACE SAFETY: We've heard a lot about a material called polybenizimidazole (PBI) which is supposed to be more fire resistant than Nomex. How is it coming along?

COLONEL LOVELADY: That's farther off but it has a lot of promise. It can withstand higher temperatures than Nomex and appears to be more comfortable in warm climates. We have some coveralls out in OT&E

and the preliminary reports have been very good. The final test results should be in during May. We're looking forward to using PBI but there are some problems to be solved if we go to it exclusively. First, we're having some trouble with color. The suits we have are light brown, and sage green dye hasn't taken well, so far. However, that'll be solved soon. The biggest problems are cost and availability. The only source at present is a small government plant and it can't produce sufficient quantities for Air Force needs. When, and if we get a civilian source, it will be another two years before we have sufficient material to meet the requirement. Then, the end items have to be made. The total time looks like about three years from now. Incidentally, the moisture regain of PBI is better than cotton and almost as good as wool. So, it promises to be a comfortable flight suit.

AEROSPACE SAFETY: How is the custom fit helmet project doing?

COLONEL LOVELADY: There are currently three ways of producing the custom fit helmet. In one, a mold is made of an individual's head by base technicians and sent to the manufacturer for final production. Another method provides a standard liner that can be shaved and cut to fit a person's head. This method will require a sufficient number of trained people at unit level to meet the demand. The third method, now in operational testing, involves pouring foamed plastic into a mold on the person's head and shaping it to fit that individual. This could possibly be done in the unit. The results of this latest test should permit a decision regarding the best approach to solving the custom fit helmet problem. We expect such a decision very shortly.

AEROSPACE SAFETY: While we're on helmets, don't we have some new visors coming along?

COLONEL LOVELADY: We have a new visor system in OT&E right now. The testing should be completed some time in May and, if it looks as good then as it does now, we should get it into the inventory by September.

The system consists of two visors, a clear inner visor of polycarbonate with the actuating knob on the right side and a dark outer visor of acrylic with the knob on the left. As you know, the old visor size varied with the size of the helmet. The new visor mechanism fits all helmets. Incidentally, while the new clear visor is very strong, it scratches easily. We currently are testing an improved coating and if it proves out we will incorporate it on the first units for issue.

Other items associated with the helmet are the new high-G offset bayonet and MBU-7/P oxygen mask. The new bayonet has incorporated an improved retention geometry which significantly betters the high-G retention of the oxygen mask. The MBU-7/P mask offers greatly increased wearer comfort over the MBU-5/P by improving face mask fit and incorporating an improved inhale/exhale valve for easier breathing. Preliminary data from our current OT&E is very favorable.

AEROSPACE SAFETY: You mentioned a new oxygen system earlier.

COLONEL LOVELADY: Yes, and this is very important. Our goal is to eliminate both high and low pressure liquid oxygen from all aircraft. We believe we can do this by one or more techniques of extracting oxygen from ambient air, utilizing available aircraft power. Such a self-contained oxygen system will have a tremendous impact on the operational mobility both in terms of cost and logistics. We are currently working with an electrochemical system which can absorb oxygen from ambient air and desorb that same oxygen in a cyclic process by simply controlling temperatures and pressure while applying a DC voltage. It is our intent to develop such a system for the B-1 aircraft.



Engineer demonstrates chlorate candle oxygen system now in use on the C-141. System eliminates pressurized walk-around bottles.

AEROSPACE SAFETY: Colonel, we've heard a lot about an advanced ejection system. Would you describe it, please?

COLONEL LOVELADY: You're talking about the Advanced Concept Ejection System (ACES). It is the departure



Mockup of ACES now under development by the contractor and Life Support SPO.

point for the development of future systems and gives us the opportunity to consolidate the knowledge of the last 15-20 years of technology into a standard Air Force ejection seat with the systems needed for the success we think we must achieve.

ACES is designed to provide a full chute in three seconds or less over the entire ejection envelope, which is 0-600K and 0-50,000 feet. The heart of the system is electronic timing that can sequence the subsystem functions with milisecond accuracy. The seat is stabilized by a gyro vernier rocket pack (stapak) in the seat pan, which assures a good platform for parachute deployment.

This seat incorporates many new concepts including a mortar deployed parachute which can be more quickly deployed and inflated and an integrated parachute harness with a single point release for faster ground egress. Our major goal has been to improve total performance with maximum comfort and we believe we have made significant progress in both areas. The ACES is undergoing testing right now and should be available to the operational F-15 as well as adaptable to our current aircraft.

AEROSPACE SAFETY: That's the kind of stuff the crews like to hear. There is also a lot of interest in survival gear that will help the man on the ground. What's new in survival avionic-radios?

COLONEL LOVELADY: Our developments in survival avionics fall broadly into two areas. The first is a continuing attempt to improve our batteries, which incidentally have proven to be a major problem. The compactness achieved in our current survival radios has severely challenged battery technology in demanding a small power source of sufficient power but still able to perform over a broad range of temperature. We see no sure cure for this problem at the moment but we are working hard for a breakthrough.

Our second front is in the conceptual stages of development and is a joint service endeavor under Air Force management. We are formulating the de-



Col Albert P. Lovelady, Director of the Life Support System Program Office, and Lt Col Fred Ewing, Program Control Division Chief, examine latest survival radio, the PRC-90.

velopment of an Advanced Avionics System which will incorporate (1) a distress incident locator, (2) a survivor locator device and (3) a transceiver.

We envisioned the distress incident locator as a means of employing a satellite relay system to fix a distress location to within a 25 mile radius anywhere in the world. This will then be complemented by the survivor locator device which will be capable of guiding a rescue aircraft through bearing and DME signals directly to the survivor. Then an ultra-miniature transceiver requiring only short range performance will complete this system capability, assuring us of timely reliable survival avionic package.

As I stated, this is a conceptual effort toward developing a tri-service, avionics system for worldwide application in the 1975 time frame.

AEROSPACE SAFETY: Colonel Lovelady, you make this aspect of life support sound exciting, a real R&D challenge.

COLONEL LOVELADY: It is exciting and promising and it is typical of the things that are beginning to happen in Life Support, a direct result of the formation of the SPO and the central management it offers. We are a relatively new organization and we have been learning and growing, but we see a challenging future with real opportunities to make meaningful gains. I am confident that we can contribute significantly to the Air Force mission. ★

IT'S YOUR



MOVE

The word went out, "It's Your Move—Make It Safely!" So the Air Force Communications Service (AFCS) and the Ground Electronics Engineering Installation Agency (GEEIA) packed themselves up and moved bag and baggage—and didn't even sprain a back.

It all began last spring when the Air Force announced the merger of GEEIA into AFCS and relocation of their combined headquarters at Richards-Gebaur Air Force Base, Mo.* Some moves of lower echelon units were involved too.

Affected were to be about 2000 military personnel and civilians moving their families, household goods and government equipment between five major points in the United States. AFCS headquarters was at Scott AFB, Ill., 270 miles from its new home near Kansas City, Mo., and GEEIA headquarters was at Rome, N.Y., about 1200 miles away.

Changes were also to be made by personnel from the command's regional headquarters at Novato, Calif., Chicopee Falls, Mass., and Oklahoma City, Okla., to new sites at Griffiss AFB, N.Y., and Oklahoma City AFS, Okla.

As plans for the big move unfolded, AFCS Safety personnel went into action. Major General Paul R. Stoney, commander of AFCS, had named the overall program, "It's Your Move—Make It Safely." No one doubted the need for a well organized and specialized accident prevention effort to compensate for the numerous built-in hazards associated with an operation of such magnitude. The enormity of the task began to appear as safety men visualized the driving, pushing, pulling, packing, lifting, tugging and carrying that was about to take place.

The big move was to commence during the summer and continue through the fall months. This meant sharing the highway with the throngs of vacationers, Sunday drivers and boat and trailer haulers. It meant added exposure for the men of AFCS and their families during the time of year when highway injuries and fatalities are on the increase.

The safety campaign, "It's Your Move—Make It Safely," was a coordinated effort between the Safety personnel of AFCS organizations at Scott, Richards-Gebaur, Hamilton, Tinker, Westover and Griffiss Air Force Bases. Educational aids, covering all known or suspected hazards, road maps and brochures, outlining the traffic laws of the various states, were distributed. Lectures and briefings were given to all personnel outlining the hazards involved in the move and explaining correct and safe methods of packing, lifting, driving, etc.

Letters and directives reminded officers and first line supervisors of the hidden pitfalls which would cause injuries. Families were provided with helpful hints and the entire campaign was geared to inform and motivate AFCS personnel, to guard against complacency and warn them of the dangers of emotional stress and fatigue.

Following the announcement in March and the first moves that began April 1, the move really gained impetus in July and was due to be completed by the end of September 1970.

More than one and one-quarter million pounds of government equipment was transported to new locations by 68 moving vans shuttling back and forth over the highways. More than ten million pounds of personal effects were moved during a 90-day period. More than 100 van lines participated. In all, 6537 people, including dependents, were moved as a direct result of the reorganization. About three and one-quarter million miles of highway travel were involved.

When the big move was completed, the record showed that not one person had been injured or killed during the entire relocation. Not even a back-strain had been reported.

***GEEIA's responsibilities had been the engineering and installation of ground communications electronics and meteorlogical equipment for all Air Force commands and for foreign nations under the military assistance program.**

AFCS provided operation and maintenance of that equipment and the Air Force's on-base and off-base communications, air traffic control and air navigational aids and facilities; also flight inspections and evaluations of the air traffic control and navigational aids. ★

THE I.P.I.S. APPROACH

By the USAF Instrument Pilot Instructor School, (ATC) Randolph AFB, Texas

PROCEDURE TURNS

Recently we've had several questions on outbound course guidance for a procedure turn. Specifically, just what constitutes outbound course guidance? Outbound course guidance is defined as, "bearing guidance from the procedure fix, i.e., VOR, ADF." When you have bearing information from the procedure turn *fix,* you may descend to the FAF altitude when you are within 20° of the *inbound* course and are headed *toward* the inbound course. (See Aug '70 "IPIS Approach" article, Point to Ponder.) This means that you are within and will *remain* within ± 20 radials of the inbound course and the aircraft heading is within 90° of the inbound course. Without bearing guidance from the procedure turn fix, i.e., DME, OM, crossing radials, you must maintain the *procedure* turn altitude until on course inbound. (See AFM 51-37 for entry procedures.)

AIRSPACE

Have you noticed in FLIP II that the Airport Traffic Area (US) has been raised to, but not to include, 3,000'.

AFM 60-16

Q Do I have to have both ceiling and visibility weather before I can file to a destination?

A AFM 60-16 allows you to file to a base using visibility—only criteria. If you do use visibility—only, be sure to figure your fuel properly. (See Nov '70 "IPIS Approach" article.)

HEY, GUYS!!

Your response to our offer to provide a copy of all "IPIS" Approach" articles (Jan '71) has been overwhelming! As a matter of fact, one gentleman wanted a thousand sets. Unfortunately, we cannot fulfill a request for more than one or two sets. If you need additional copies, your base publications may be able to reproduce them.

CLEARANCES

Q Are there times when I can neither receive nor accept an abbreviated clearance?

A Yes; an abbreviated clearance can neither be issued nor accepted if the route of flight originally filed with ATC has been changed by the pilot. In this case, the *pilot* will request a detailed clearance. (Section II, FLIP Planning.)

Q Do I have to read back an ATC clearance?

A We know of no directive which requires you to read back clearances, either received on the ground or in the air. However, FAA Manual 7110.8A states, "Either controllers or pilots *may initiate* readback of a clearance when it is considered necessary." Additionally, your MAJCOM directives may require readback of specific clearances. Readback of clearances that are complex or doubtful is recommended.

IFF IDENTIFICATION

Q When ATC directs "IDENT," are we required to acknowledge by a "Roger" or "Wilco," etc.?

A Most controllers consider the act of "IDENTING" as sufficient acknowledgment of the IDENT request by ATC.

PILOT REPORT VS WEATHER REPORT

Q I took off when the visibility was reported to be two and one-half miles. The visibility was actually five miles and I reported it as such. I requested a VFR pattern. The tower controller would not allow it because the visibility was still being reported by the weather observer as two and one-half miles. Which takes precedence, a weather observation or a pilot report?

A The visibility reported by the weather observer is a prevailing visibility value. You may have been in an area of five miles visibility; however, visibility in other quadrants may have been sufficiently lower to justify the prevailing two and one-half miles value. Visibility is normally measured and would not be subject to change based on a pilot report. If the *ceiling* is *estimated,* then a pilot report within 15 minutes of the time of the observation would take precedence and the weather observer would change his observation in accordance with the pilot report. However, if the *ceiling* was *measured,* then the weather observer is not required to change his observation. ★





RAMP RECKS

MAJ EDWIN L. MARSH
Directorate of Aerospace Safety

Gentlemen, we must reduce the number of flight line incidents and accidents. Simple as it may seem, this is one problem area we haven't been able to lick.

Flight line marshallers continue to direct aircraft too close to hangars, other aircraft, vehicles, fences.

Maintenance men pre-position AGE too close to aircraft parking spots or signal pilots to taxi before properly clearing the area.

Pilots taxi too close to vehicles, obstructions and other aircraft, or grossly misjudge clearances.

Drivers of flight line vehicles park in the wrong spots, or drive into aircraft, and civil engineers fail to maintain ramps and taxiways to acceptable standards.

Here are some prime examples of what we mean:

• A C-124 had followed a long line of departing aircraft and was preceded by a commercial 707, which stopped on the runup pad headed toward the active runway. The pilot of the C-124 maneuvered his aircraft to the extreme left side of the taxiway and intended to taxi behind the 707 to get into position for an engine runup. Both the copilot and scanner told the pilot that clearance would be minimal but believed the wingtip would clear the 707. They were both wrong, and the right wing struck the 707's elevator, damaging it beyond economical repair. (What do you say to the airline captain at this point—oops?)

• At the opposite end of the size spectrum, a U-10 pilot recently landed at night at a large international airport and proceeded to taxi toward the parking area. He did not request transient services from the contract facility. The ramp area was not lit nor did it have yellow taxi lines; however, the pilot was aware of a white line denoting the parking area limits and believed that if he followed this line, adequate wingtip clearance would be assured. He was also aware of a fence to the right of the ramp entrance, which he could see lit by red obstruction lights. The pilot picked out a familiar looking white line and began to follow it. Unfortunately, it was not the line denoting the parking area, but one that marked a vehicular road. The copilot saw an unlighted post too late to avoid crunching the right wing. (The false sense of security due to the relatively familiar environment led to relaxed vigilance on the part of the pilot.)

• The pilot of a C-130 knocked off two feet of the right wing, damaged the wing spar, and caused $2500 in damage to a hangar while attempting to taxi between two hangars, unaided by wing walkers or marshallers. He was relying entirely on a Follow Me vehicle to lead him. (Didn't *anyone look* at wingtip clearance?)

• A C-7A was damaged at an overseas location by a forklift. The driver engaged the wrong gear and instead of backing up after loading

the last pallet he rammed forward into the aircraft. (The driver possessed a valid [?] operator's permit.)

• Following dearming, an OV-10 was maneuvering toward the ramp and struck a dearming vehicle. The vehicle was too close to the taxiway and no wing walkers or marshallers were used.

• Two B-52s assigned to the same wing were damaged within a few days of each other when they each struck a snow bank while taxiing. In both cases, snow was banked too close to the parking stubs and taxiways.

• Another B-52 sustained damage to the fuselage and radome when it jumped the chocks and ran into a parked metro van crushing it into a nose dock. An engine run was being performed by a qualified engine technician; however, he was not familiar with hydraulic system operation, nor had he been required to receive such training.

• Seven aircraft, ranging in size from an OV-10 to a C-141, struck parked trucks on the ramp; 15 others struck trees, fire bottles, water pipes, blast deflectors and buildings, while taxiing.

The examples cited above are a random sample of the numerous avoidable ramp mishaps reported in the past year. What can be done to avoid these needless, expensive and unwarranted mishaps? Let's take a look at how some problems have been remedied at one base.

One FSO we know drove down to the ramp at night to search out the most hazardous areas. His first impression was that many work areas where vehicle traffic was heavy were inadequately lighted. To him the answer was obvious—more lighting in these selected areas, or, where this was impractical, move the work areas to the existing lights. The same FSO attached reflective tape to aircraft pin streamers, engine covers, etc. At night the aircraft stood out in reflected silhouette.

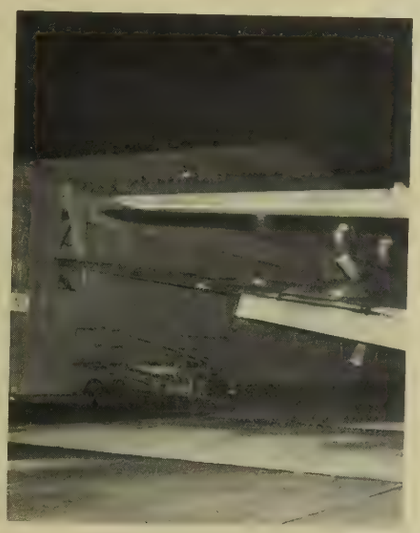
Perhaps these measures won't work or would be impractical at your base, but they did reduce the number of flight line incidents at his. Here are some other suggestions that should be at least minimum standards at all bases:

Vehicle operators should be thoroughly trained for all flight line operations, and recognize the increased hazards involved while operating around aircraft.

Emphasize proper training and supervision of ground marshallers. They must be able to demonstrate all of the commonly used ground signals in a manner that pilots will recognize. Above all, they should be constantly alert to insure that aircraft are taxied safely in congested areas.

Maintenance men serving as wing walkers should be familiar with lead times required for rendering ground-to-cockpit signals. Pilots should not assume that every man on the flight line is qualified to marshall an airplane. (However, it wouldn't be a bad idea for every man working on the flight line to know at least the emergency signals.)

Regardless of whether or not wing walkers are used, aircrews must be reminded constantly to remain alert when taxiing near objects on the ramps or taxiways. If doubt exists regarding proper clearances—**STOP** and wait for wing walkers.



Transient alert personnel must be aware of airfield capabilities, i.e., the type and size of aircraft that can use every area of the ramp, which aircraft can use existing taxi lines with adequate wingtip clearance, etc.

Civil engineers should insure that airfield markings, lighting, obstruction clearances and snow removal are up to acceptable standards at all times; that obsolete taxi lines are completely obliterated; and current taxi lanes are readily discernible. (What about reflectors spaced on taxi lanes similar to those used to denote driving lanes on many highways?)

Never pre-position AGE if there is any chance that a parking or taxiing aircraft might hit it. The few moments saved will never make up for the time and expense required to repair the aircraft and to report and investigate an accident.

Vehicle operators must insure that their equipment is properly lighted, parked, chocked, and kept in good operating condition.

All AGE and ground vehicles operating on the ramps should be prominently marked with reflective tape as required by AFM 127-101 and appropriate tech data.

Establish procedures for handling stalled vehicles on the ramp or taxiways. Radios should be used to summon help if possible so the driver won't have to abandon his vehicle.

For every suggestion above, a dozen others could probably be presented. Enterprising safety, maintenance, operations and civil engineering personnel should be able to come up with many good ideas tailored to their specific base. A little extra time, money, training, and use of just good common sense can save thousands, perhaps millions, of hard-to-come-by defense dollars and manhours. ★



NUCLEAR SAFETY AID STATION



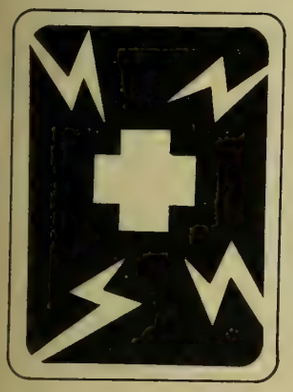
BUDD WHEELS, STUDS AND NUTS

A recent evaluation made by personnel of the Directorate of Materiel Management, Hill AFB, regarding wheel stud failure in a reentry vehicle/guidance and control (RV/G&C) van has been completed. The exhibits included wheels, hub, drum, wheel studs, and inner and outer lug nuts. The investigation revealed that one of the outer wheels had a wider flange than the wheel normally used. Three of five studs were not Budd studs, and none of the five inner and five outer lug nuts were Budd nuts. TO 21M-LGM30F-4-4 should be used to obtain proper part numbers for these studs and nuts. In addition, the lug nuts (inner and outer) were loose for some period of time prior to the stud failure. Commercial trucking industry personnel informed Ogden Air Materiel Area (OOAMA) that broken wheel studs are experienced when nuts are not kept tight. The exhibits indicate that the inner lug nut is the one that is not being kept to proper torque. OOAMA strongly recommends that you comply strictly with step-by-step torquing procedures and insure that proper wheels, studs and nuts are used when replacements are required. Emphasis is placed on the requirements in TO 3629-8-40-1, 30 May 1969, page 3-21, para. 3-46, changed 21 Aug 1970, for keeping the lug nuts torqued.



THE CASE OF THE INVISIBLE MISSILE CONTROLLER

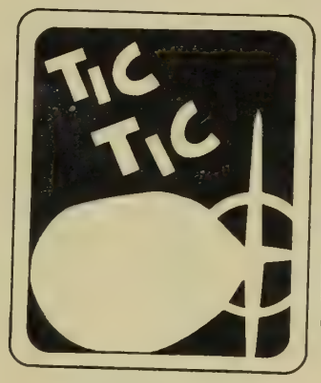
During a normal strategic alert at a missile site, the "ENABLE" indication illuminated at the crew commander's panel. This indicated that the missile was prearmed and ready to accept a launch command. Needless to say, this condition resulted in an immediate response to the affected launch complex. Investigation by maintenance personnel revealed that a loose wire was responsible for the inadvertent ENABLE. The wire was reconnected and the ENABLE indication extinguished. It is believed that the wire was accidentally loosened during the accomplishment of a time compliance technical order (TCTO). The lesson to be learned is don't foul up the rest of the system when performing maintenance on a part of the system. Always follow TO procedures to the letter and don't try shortcuts, especially when performing maintenance on sensitive Command and Control equipment.



AID REPORTING

In the day-to-day business of analyzing accident/incident/deficiency (AID) reports, it is refreshing to come across a report which is clear, concise and contains all relevent facts required to determine the nuclear safety impact. Recently such a report (71-6) was received from the 90th Strategic Missile Wing at F. E. Warren AFB. The Dull Sword report described the specifics of the malfunction (how the system behaved), the nature of the maintenance action and their findings (what was done), the nuclear safety implications and actions taken to reduce the hazard, and a statement relating to compliance with applicable procedures and policies.

The importance of careful and meticulous preparation of AFR 127-4 reports cannot be overstressed. It is important that all relevent information pertaining to a nuclear accident, incident or deficiency be included in the report in order that higher headquarters can take expeditious and effective corrective action when necessary. Too often valuable time has been lost by having to obtain additional information from the field. Our hat is off to the nuclear safety officer of the 90th SMWg for a job well done.



DO NOT USE WEAPONS AS TESTERS

Exactly 60 days ago we reported a case via the AID Station where a nuclear weapon had been used to troubleshoot a faulty Aircraft Monitor and Control (AMAC) system. The title of that article was "Disconnect—Then Test." Well, it's hard to believe, but it has happened again. This time the weapon was disconnected and downloaded; however, required AMAC tests were not performed and the weapon was loaded and downloaded three times before the faults were corrected. Specifically, an AMAC postload electrical check indicated a fault in the system. The weapon was downloaded but the required GWM-4 check on the aircraft system was not performed. A preliminary inspection of the weapon indicated no malfunction. The weapon was loaded again and sure enough, the same fault indication was present. The weapon was again downloaded and the required tests performed. It was determined that the aircraft weapons control unit was at fault. The unit was replaced, the weapon loaded, and for the third time the fault indication was present. Another download and tests indicated that the break pin on the weapon was broken. **Repeat lesson**—you don't load a nuclear weapon on an aircraft if there is an indication of a fault in the AMAC system. Isolate the fault using approved procedures. **Correct** the fault, then load the weapon. ★

ORVILLE STINSON, PHOENIX TOWER
Reprinted from Journal of Air Traffic Control

THE EVILS OF TECHNOLOGY

You may not believe this, but there is a fellow who claims to have perfected a voice retriever gadget. Based upon the theory that the spoken word goes on and on endlessly (wifelike) through space, it follows that, with proper instrumentation, all vocal utterances from the beginning of time can be replayed.

We will agree that possibly there is some historical or dramatic value in hearing, for example, one named Noah as he implores *"Which one of you cats is rocking the boat?"*; or to be more recent, to hear Brigadier General George Armstrong Custer as he exclaims, *"Whereinell did all these (____) Indians come from?"*

But we definitely approach all other possibilities with visible trepidation. For in many years of shattering the airwaves with command decisions, we and our cohorts have managed, with considerable aplomb, to give birth to a few statements which should forevermore be permitted to rest in peace.

We recall a local controller of no little repute, who acquired instant immortality with the simple expression *"Straight out approach approved!"* This, and *"For further touch and gos you'll have to make a full stop landing or leave the pattern!"* are considered by all the down-the-tube-goers as the epitome of concise traffic control instructions.

Also, we would certainly be remiss if we overlooked another notable transmission of urgent words of wisdom, to wit: *"Go around, your gear is not UP!"* And we must not overlook the poor maligned trainee who suffered severe bodily bruises as the result of *"No-radio Cessna, contact ground control on one two one point niner."*

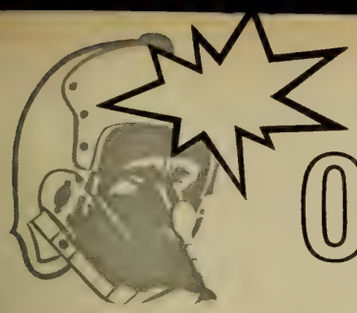
But ATC communication is a two-way affair, and pilots are no exception when it comes to decimating the decorum of an orderly traffic pattern. Advised to call the freeway on final, one sterling chap complied explicitly with *"Hello Freeway," "Hello Freeway!"*

Even the jumbo jets are getting into the act. As the result of a rather heated disagreement within the tower, the following query was offered, *"How many wheels are you supposed to have on that aircraft?"* Well, as all of you should know, when you really want to know something about an airplane, you naturally ask the pilot. This held true in this case, for the information received in reply was *"Why, are some of them missing?"*

For such reasons, we cannot in good faith drum up a modicum of enthusiasm for the aforementioned fink machine. This is not necessarily because we have attained the status of lasting remembrance for a dubious decision or two.

Rather, it is because we suspect that our one personal vocal claim to fame, most likely to reverberate through the years to come, is the anguished wail of a too-well-skewered controller, making his urgently bidden appearance on a Blue Monday, in the Inner Sanctum:

"But, Chief—But, Chief—!" ★



ON THINKING AHEAD

One of the more interesting magazines we've encountered lately is the US Naval Institute's *Proceedings*. In a recent issue we found a fine article by Captain E. F. Oliver, USCG, on the gargantuan oil tankers developed since World War II.

There are some mammoth problems associated with the operation of these mammoth ships, but one—the problem of stopping in an emergency—is of particular relevance to anyone interested in safety.

The World War II T-2 tanker weighed 17,000 tons. It could come to a "crash stop" within one-half mile—but it took five minutes of engines "full astern," during which time the ship's captain could neither steer nor regulate speed. For the 200,000-ton *Idemitsu Maru*, a screeching halt takes approximately two and one-half miles and 21 minutes. By extrapolation, "crash stop" for the 400,000-ton tanker now being built will take four or five miles and 30 minutes, and plans for a one million-ton tanker are on the drawing boards!

Working within the limited maneuverability of ships of this size is tricky business—an error in planning, or lack of planning at all, can easily result in disaster.

Despite the differences in speeds, distances and times, the tanker captain and the airplane pilot have pretty much the same problems and, oddly enough, the same solutions. If emergency action is needed, it's needed *now*, and there's precious little time to talk it over, whether airborne or at sea. We depend on our training, knowledge and professional skill to cope with an emergency, and we depend on competent pre-planning to avoid self-induced emergencies. At least, we should . . .

- The crew of a C-124 requested an enroute altitude 4000 feet blow the MEA for the route, several hundred feet below actual terrain within a few miles of course —and below the published minimum altitude for reliable NAV radio reception. Disaster occurred—as programmed.

- On a navigation training mission (!), a T-37 IP and student diverted into a large civilian airport when destination weather deteriorated. After casting about for help and calling the flying supervisor at home station, the IP decided to RON and make the short hop to his military stopping point the next day, under VFR conditions. They took off the next day, planning for five minutes of flight with 17 minutes of fuel on board (even though a little deeper research would have disclosed a suitable alternate fuel available where they were). The only nav-aid on board was inoperative on taxiing, but the IP elected to continue, confident that pilotage would get them where they wanted to go (the only maps on board were ONC charts and the final report asserts that no more suitable maps were available—but it's hard to imagine a large civilian flying facility with no sectional charts for sale). They took off as scheduled, climbing out on course. Approximately five minutes later the destination airfield passed under their right wing, but neither crewmember saw it. After 11 minutes of flight they recognized their bind and started asking for help. The help they got was something less than we might hope for, but it's doubtful that anything would have extracted them from their self-built box by then. The airplane flamed out after 17 minutes of flight and both crewmembers ejected successfully.

Airplanes being what they are, there is often precious little time to think out a problem in flight. The only time we can really count on having is that time *prior* to flight, and conscientious use of that time can—and does—pay handsome dividends.

To the ocean-pilot's advantage, adequate pre-planning is sufficient to avoid sailing up a box canyon, and even if he did, a ship is capable of stopping and backing out. Unfortunately, an airplane can't do that.

- A T-33 pilot and his non-rated passenger were killed in a "box-canyon" episode. Starting at something less than 2000 feet, above open water, the pilot turned inland, climbing above a 12-degree slope, intending to go through a gap at the 8200-foot level. Near the 5000-foot level the impossibility of clearing the mountain became painfully apparent, and the pilot made a right turn to get out of the trap. Airspeed, thrust and deep desire were inadequate to sustain flight in a climbing turn, and the airplane crashed near the 5400-foot level.

Planning goes a long way toward assuring the success of any endeavor; but when it comes to flying airplanes, planning goes a long way toward assuring survival as well. ★

REVERSE THRUST

In considering just how marginal an abort near V_1 really is on a heavy weight takeoff under critical runway conditions and how dependent successful accomplishment is on the correct handling technique, a large international airline decided to carry out an analysis of its flight crew capabilities under such circumstances.

Using a B-707 type simulator and fully qualified B-707 Captains and First Officers, they tested more than 150 cases of rejected takeoffs. No special briefings were given by the instructor nor were the pilots prewarned that engine failure before V_1 would occur. Engine failures were not simulated, for the most part, by retarding thrust levers. Many think that closing the thrust lever to simulate engine failure in an airplane gives the crew too great a clue; hence, the training is less than realistic. But the simulator provides a way by which this important clue can be eliminated. Finally, no pilots' names were logged; and there was no "fail-pass" association; and only the first scheduled rejected takeoff by each pilot was analyzed.

The airline came up with some very interesting data. Most of the pilots, 99 percent, in fact, correctly identified the failed engine, but 12 percent took from two to four seconds to do so and two percent took more than four seconds. After correct identification and call, 18 percent of the pilots took another two to four seconds to react properly and another 17 percent took more than four seconds. These results should be compared with the certification of the B707-300C which considers brake application, thrust reduction and speed brakes up to be completed in three and one-half seconds. Any delay in throttle closure can result in serious speed overrun. Also, certification tests assume a hard, dry pavement with no degradation of the coefficient of friction.

Now comes the interesting part. While just about everyone, i.e. 99 percent, used reverse thrust, *23 percent did not use symmetric reverse thrust!* This was about the most goofed-up aspect of the whole thing. The difficulty pilots have in reaching over the throttle quadrant and reversing two symmetric engines is noteworthy. Time and time again the wrong two are cracked and the concentration required for correct selection seems to force the pilot into lowering his eyes into the cockpit for an excessive length of time to the detriment of aircraft directional stability. During this period, more important matters, e.g. FULL BRAKING, are overlooked.

Pilots should continue to discipline themselves into remembering that certification established the ability to stop *without reverse thrust,* and that if everything else is done right it is a fringe benefit only and should be categorized as relatively low priority.

Reverse thrust contributes from 200-400 feet of stopping ability to the aborted takeoff. Although this may appear a minor increment, it certainly should not be ignored. The nature of the deceleration curve is such that if the runway proves too short, the speed off the end will be substantial, e.g., if it is too short by 300 feet, you would expect to leave the end of the runway at 50-60 knots. And consider—the 200 feet you save by using effective reverse may be the 200 feet you threw away in lining up for takeoff, a maneuver which is not accountable in the calculation. ★

(Flight Safety Foundation Bulletin)



Since we started breathing life into the Rex program some months ago, we have been gratified at the response from the field. Our traveling Air Force has begun to let us know when they are pleased or displeased about transient services. On the other side of the coin, most commanders are quick to respond when valid deficiencies in their transient facilities are identified. We think from what we hear and see, transient services have improved Air Force-wide. On the theory that if a little effort does a little good, a lot of effort can move mountains, we're going to put more emphasis on the entire program. For example, transient facilities will become a special interest item of the UEI teams. They will submit their in-depth evaluation of a base's transient capability to Rex upon completion of an inspection. Since this is still limited in scope, we again ask that you troops on the move let us know where service can be improved. As an additional aid, Base Ops should provide you with a critique sheet which can be evaluated by the particular base or if the transient feels it necessary, the questionnaire can be sent directly to Rex Riley, Directorate of Aeroscape Safety (IGDSEA), Norton AFB, California, 92409.

These evaluation sheets should be readily available to transients. Without them, it is unlikely that the individual responsible for transient services will ever know that he has a problem area. The locally reproduced forms used and distributed by this directorate have Rex's address on the back along with the "Postage and Fees Paid" statement so all that is necessary is scotch tape, staple, or whatever is handy and the US Mail does the rest. (AFM 10-5, Ch. 6)

Rex is always looking for ways to improve the program so let's hear from you! ★



REX RILEY

Transient Services Award

LORING AFB	Limestone, Me.
McCLELLAN AFB	Sacramento, Calif.
MAXWELL AFB	Montgomery, Ala.
HAMILTON AFB	Ignacio, Calif.
SCOTT AFB	Belleville, Ill.
RAMEY AFB	Puerto Rico
McCHORD AFB	Tacoma, Wash.
MYRTLE BEACH AFB	Myrtle Beach, S.C.
EGLIN AFB	Valparaiso, Fla.
FORBES AFB	Topeka, Kans.
MATHER AFB	Sacramento, Calif.
LAJES FIELD	Azores
SHEPPARD AFB	Wichita Falls, Tex.
MARCH AFB	Riverside, Calif.
GRISSOM AFB	Peru, Ind.
PERRIN AFB	Sherman, Tex.
CANNON AFB	Clovis, N.M.
LUKE AFB	Phoenix, Ariz.
RANDOLPH AFB	San Antonio, Tex.
ROBINS AFB	Warner Robins, Ga.
TINKER AFB	Oklahoma City, Okla.
HILL AFB	Ogden, Utah
YOKOTA AB	Japan
SEYMOUR JOHNSON AFB	Goldsboro, N.C.
ENGLAND AFB	Alexandria, La.
MISAWA AB	Japan
KADENA AB	Okinawa
ELMENDORF AFB	Alaska
PETERSON FIELD	Colorado Springs, Colo.
RAMSTEIN AB	Germany
SHAW AFB	Sumter, S.C.
LITTLE ROCK AFB	Jacksonville, Ark.
TORREJON AB	Spain
TYNDALL AFB	Panama City, Fla.
OFFUTT AFB	Omaha, Nebr.
ITAZUKE AB	Japan
McCONNELL AFB	Wichita, Kans.
NORTON AFB	San Bernardino, Calif.
BARKSDALE AFB	Shreveport, La.
CHANUTE AFB	Rantoul, Ill.
KIRTLAND AFB	Albuquerque, N.M.

what happened to the T-38

TRAINER AIRCRAFT ACCIDENTS IN 1970



LT COL LARRY T. COOPER
Directorate of Aerospace Safety

The Air Force pilot trainer fle
which includes the T-28, T-3
T-37, T-38, and T-41, co
tributed significantly to the gr
reduction in USAF aircraft accide
last year. These five aircraft expe
enced a total of 29 major accide
during 1970 compared with 39
1969, for a reduction of 26 perce
By type, T-28 accidents were
duced from four to none, T-33 fr
15 to seven, T-37 from nine to fi
and T-41 from two to none. O
the T-38 experienced an increa
from nine to 17.

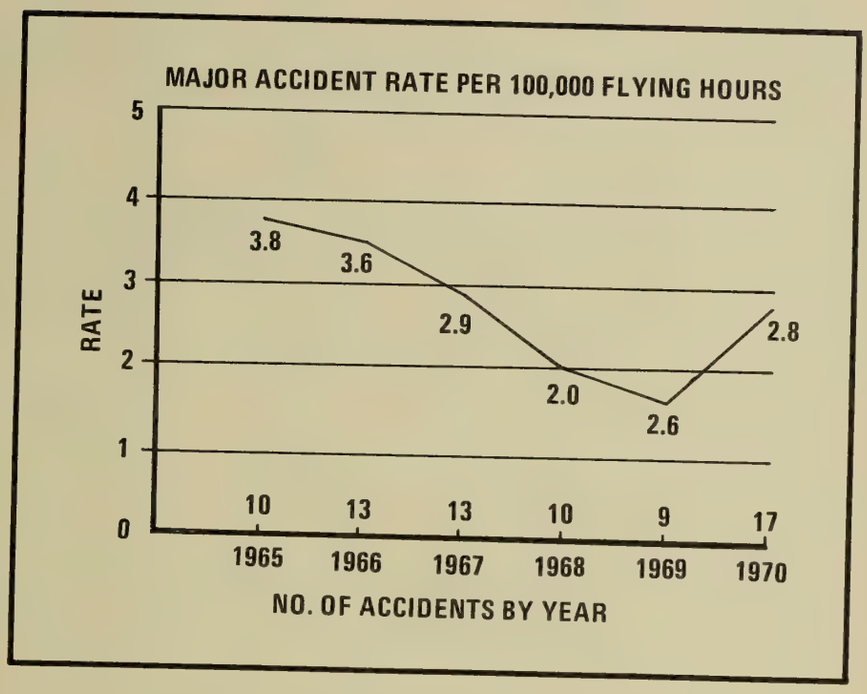
Obviously, a variety of fact
and circumstances combined
achieve this marked reduction
trainer accidents. However, the m
significant factors appear to be i
proved engine reliability and c
rection of structural problems in
T-28; improved pilot discipline
the T-33, especially during
weather approach phase; structu
modifications, improved main
nance, and increased supervision
pilot training in the T-37; and tig
er operational restrictions regard
surface winds in the T-41.

Although the T-38 major accident rate for 1970 of 2.8 major accidents per 100,000 flying hours was still slightly below the overall USAF rate of 3.0, this was the first annual increase since 1965 and the highest rate since 1967. The 17 accidents in 1970 were four more than the previous high of 13 in 1966 and 1967.

These statistics are more significant when considered in light of all other USAF aircraft and the overall improvements accomplished, both individually and collectively. Of all 16 USAF fighter and trainer type aircraft, the T-38 was one of only three showing an increase in the major accident rate during 1970, and the other two increases were slight. The T-38 rate increase of 1.6 to 2.8 represents a 75 percent jump, which is significant regardless of which statistical yardstick is employed to measure accident experience and trends.

Although the 1970 T-38 accidents were attributed to a wide variety of cause factors, the major increases occurred in pilot factor and instructor pilot supervisory areas, which increased from four to eight and from none to two respectively. In addition to the two IP supervisory factor accidents, instructor pilots were the primary cause of three pilot factor accidents and were directly involved in three others. This is a reflection of reduced instructor pilot experience levels and indicates the continuing need for close supervision of all aspects of the Undergraduate Pilot Training Program.

This graph illustrates the favorable trend enjoyed by the T-38 since 1965 and the sudden reversal in 1970.



While these statistics reveal that the T-38 had a relatively poor safety year, they do not imply that there are any inherent problems in T-38 operations nor that pilots and supervisors have failed to do their jobs.

In 1970, the T-38 fleet of slightly over 1000 aircraft flew approximately 610,000 hours, which is second highest of all USAF aircraft. When this is equated to almost 600,000 sorties and more than 1.1 million landings, it becomes clear that most students, instructors, and supervisors were obviously doing the right thing, at the right time, all of the time. And this is what is required to fly that many hours, on that many sorties, and accomplish that many landings without having any accidents.

But let's look at it this way; if each and every T-38 student pilot and instructor pilot had done the right thing, at the right time, all of the time during 1970, 12 major accidents would not have happened; 11 T-38s would still be flying; and eight pilots would still be alive. All you T-38 drivers think about it, and maybe 1971 will be a reversal of 1970 with a return to the downward accident trend previously enjoyed. The first three months of 1971 indicate that this is being accomplished.

The T-38 is a good, safe, reliable bird, but like all aircraft, especially high performance jet types, it is extremely unforgiving of complacency, poor judgment and errors, particularly in the traffic pattern, and let's face it; that's where you guys spend a great deal of your time. ★

TECH TOPICS

briefs for maintenance techs

free wheeling

The C-118 pilot discovered after takeoff that his left gear did not retract fully. The engineer looked the situation over but was unable to determine the problem. The gear handle was then placed in the down position and the gear promptly went down and locked. It was left down while the aircraft returned to home station. After about 3000 feet of the landing roll, violent bumping occurred. The brakes had been operating normally, but they ceased to operate after the violent bumping. The aircraft was stopped by using the emergency air brakes.

Maintenance found that the nut on the left main gear scissors bolt had been forced off the bolt. The nut was found on the runway where the last touch and go landing had been made. So it was decided that the nut came off during the landing. With the scissors disconnected, the gear was allowed to castor freely. It was determined that the nut was oversized and had been pressed off the bolt, shearing the cotter pin. It is believed that the scissors bolt and nut had not been worked on since the last IRAN in May of 1968.

How is it possible for a knowledgeable maintenance man to install an oversized nut on such a critical component? Or, how could such an installation go undetected for nearly two years? However you answer those two questions, you have to admit that landing with one of your main gears castoring in the breeze is a sport in which nobody wants to participate.

"where's the hole?"

As the aircraft pulled into the parking space and stopped, the assistant crew chief ducked into the wheel well area with the speed brake collar and the main gear pin in his hand. He installed the speed brake collar on the actuator, but in the dark was unable to find the hole for the gear pin. As he left the wheel well, gear pin still in hand, he walked under the intake area and the pin and streamer were pulled from his hand and ingested by the engine.

Local procedure has been changed to install the pin and collar after engine shutdown. Even so, it needs to be emphasized again and again that we can't be too careful around jet intakes. And what was the assistant crew chief doing without a flashlight?

taxi tangles

Once again it's time to highlight those terrible taxi tangles. Usually the airplane driver is blamed for taxi accidents even though someone on the ground is waving him on. To give you an idea of what's been going on, here's a review of some of the tangles that have taken place in recent months.

- Due to limited parking space

two helicopters were attempting to park in the same revetment. As soon as the first one was spotted, the second one began to maneuver into position. However, one of his rotor blades struck the rotor blade of the one already in position. The reasons were (1) misinterpretation of hand signals from one maintenance man to another and also by the pilot, (2) no guide lines for parking two helicopters in one revetment, (3) the ground crewmember was using a grounding point in the ramp as a reference point for parking the chopper; however, he was using the wrong grounding point. Looks like it would have been a lot easier for all concerned had the revetment been marked beforehand to accommodate the two choppers.

• C-7—the report reads, "While the aircraft was being maneuvered into a designated C-7 parking spot in a revetted, U-shaped ramp which accommodates several C-7 aircraft, the right outboard flap hinge bracket struck the top of a revetment wall." The report further reads, "After heading into the revetment at a slow speed the pilot began a 180 degree left turn away from an adjacent C-7. As the aircraft was moving left to parallel the rear revetment wall, a maintenance man between the aircraft and the revetment wall, gave the pilot a thumbs' up signal. Based on this signal, both the copilot and the flight mechanic reported 'clear right' to the pilot. As the aircraft continued to turn toward the intended parking spot, the right wing passed over the maintenance man's head, and the hinge bracket hit the revetment wall." Again maintenance gave, and the flight crew accepted, *unauthorized* hand signals.

• A B-52 struck a parked step van and pushed the step van into the nose of another parked B-52. The step van had been left unattended 15 feet inside the taxi clear zone. Who got tagged for it? The aircraft driver, of course. But who left an unattended step van in the taxiway?

Getting back to the hand signal department, there is a strong indication that AFR 60-11 should be reviewed by both maintenance and flight crews.

three for one

While preflighting a B-57, following checklist procedures, the aircrew connected the battery to the aircraft. A short time later fumes were detected and smoke was observed coming from the battery compartment. The crew immediately extinguished the fire and disconnected the battery.

Investigation revealed that the cover used on this battery had been modified with vent holes in accordance with TO 1C-135(K) A-2-10. Since both aircraft (B-57 and C-135) use identical batteries, the covers are interchangeable. In this case a cover modified for a C-135 had been installed on a B-57. After the vent holes had been drilled, they had not been reamed out or the burrs removed. These burrs had made contact with the battery terminals causing a short that ignited the battery. After checking a little further, maintenance discovered that, although the battery had been through the shop on two occasions for cleaning and repair, the socket head screws in the cells and receptable risers were still installed. TO 8D2-3-1 requires replacing these socket head screws with hex head bolts. This would have increased the clearance between the battery cover and the terminals and possibly may have prevented the burrs from shorting out on the terminals.

It took three different acts to set the stage for this incident. Elimination of any one—burrs on the cover, installation of the wrong cover, or modification per TO 8D2-3-1—would have prevented the incident. Our ultimate goal, of course, is to eliminate all steps that could lead to an incident or accident.

wrong way doesn't pay

The seat kit and parachute had been removed from the A-7 aircraft. A personal equipment man, while trying to free the arming lanyard, exerted enough pressure to cause the cartridge actuator device to fire. The reason for the incident was given as follows: A split rubber hose had been used to protect the arming lanyard and the hose was taped in two places to secure the arming lanyard within the hose. So when the P.E. man tried to pull the arming lanyard free—BANG! True, the P.E. man should have been more

TECH

briefs for maintenance techs

TOPICS

cautious when handling an arming lanyard; but protecting the arming lanyard with a rubber hose was an unauthorized procedure. The results show why.

how to ruin a prop

A C-7 was marshalled into a parking spot, but before the engines were shut down, the crew received a frag change. When the aircraft came to a stop, the flight mechanic climbed down from the overhead hatch and went to the rear of the aircraft to prepare for chocking. Meanwhile a maintenance man moved a 50 pound CB fire extinguisher from the edge of the ramp and placed it in front of the number two engine, then jumped in his vehicle and departed.

Along with the frag change, the pilot also was given instructions to move the aircraft to a new parking spot. As the flight mechanic was climbing back to his position in the roof hatch, the pilot released his brakes and started to taxi. After moving approximately 13 feet forward and slightly to the left, the number two prop struck the fire extinguisher.

There were several contributing factors in this incident, but one provides an obvious lesson: maintenance should never park a fire extinguisher or any other equipment in front of an aircraft that is running, especially one that has just taxied in and does not have chocks installed.

fire warnings

If you were to analyze the one thing most feared by everyone who ventures skyward, the answer would no doubt be fire.

Because of the dangers of inflight fires, fire warning systems have been installed on most aircraft. However, these warning systems are only as good as the people who maintain them. Pilots would have more faith in the system if they knew that every time the light flashed they either had a fire or an overheat condition. Some of you maintenance types are no doubt reacting to that last statement with such thoughts as, it's not our fault, it's the fault of the fire warning circuits, they are no good. Granted, all the fire warning circuits are not one hundred per cent reliable, but many a pilot has received a faulty indication due to improper maintenance. (Like the boy calling wolf once too often. Pretty soon the pilot just doesn't know if he should believe the light or not.) To give you some idea, here are a few of the incidents reported in the last six months.

The O-2 pilot shut down his rear engine because the fire warning light came on. After landing, maintenance found the fire detection wiring improperly routed.

After an F-4 made a single engine landing because of a fire warning light, maintenance found a pinched loop in the fire warning flex cable.

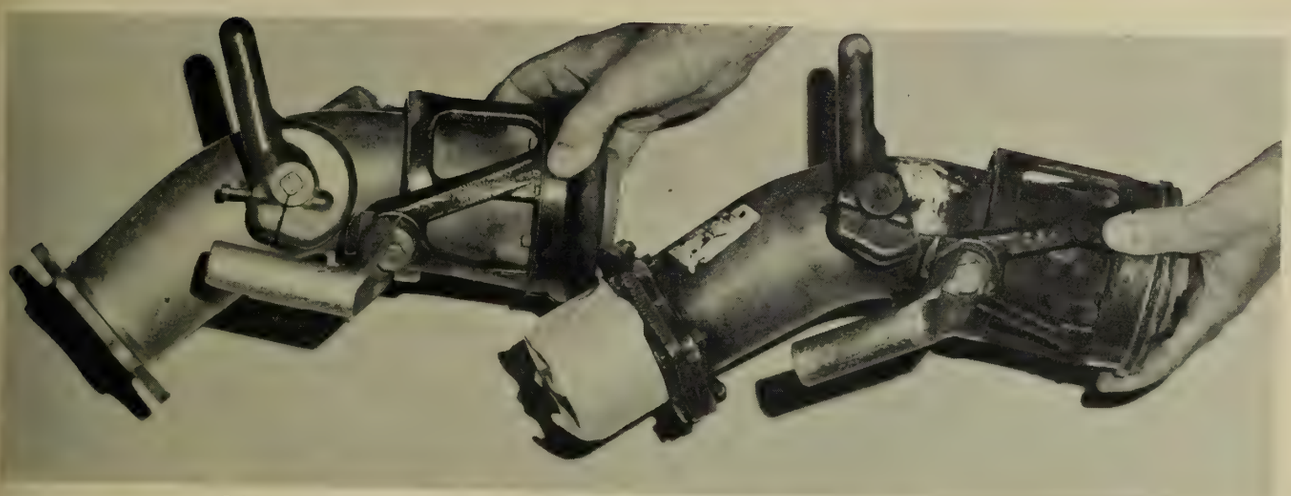
A T-37 returned with one running and one shut down—fire warning light again. This time maintenance found a fire warning connector saturated with dirt and oil.

These are only three of the many incidents that have been reported. The causes vary from a piece of safety wire shorting out the terminals to loose connections. They all reported that there was no other indication of a malfunction other than the warning light. However, once that light starts flashing, the pilot has no choice but to believe. But how long would you believe if you were to frequently get a faulty indication?

high cost item

An engine run team plus two supervisors were in the process of clearing two maintenance discrepancies on a C-5 aircraft: (1) fluctuation of number one and number four brake pressure gages, (2) operation of four newly installed generator control panels. All four engines were operated at idle for approximately ten minutes. As the throttles were advanced to 75 percent, the airplane moved forward over the chocks and traveled approximately 100 feet before being stopped with the emergency brake system.

Damage to the aircraft was approximately $8,000. After reading something like this we must ask ourselves questions like, was the brake operator qualified in accordance with AFR 60-11? Is it possible that someone might believe that chocks alone will keep an aircraft from rolling forward during power checks? *They will not.* In this incident (so reads the report) someone inadvertently released the parking brakes prior to advancing power. ★



CAM INTACT

BROKEN CAM



GOOD CAM

BAD CAMS

DISTORTED

WOULD YOU USE THIS NOZZLE?

W. J. Haynes, SAAMA, Kelly AFB, Texas

During a hot pit refueling a single point refueling nozzle became disconnected from an F-4 aircraft. Considerable fuel spilled and ignited, causing extensive damage to the aircraft.

The investigation report stated that the primary cause of the accident was failure of the nozzle crank handle locking cam which permitted the single point refueling nozzle to become disconnected from the aircraft.

This cannot be denied. The handle was broken and it did fail. Would you have used this nozzle with the broken handle? Someone did. All of the broken handles in the above picture were removed from nozzles at one base. Good maintenance practices would have replaced all of the broken handles.

No EUMRs had been received by the AMA prior to the accident. The report also stated that technical data on operation of the nozzle was inadequate. No AFTO Forms 22 had been received by the AMA prior to the accident advising that technical data was inadequate. Would either of these actions have prevented the accident? We will never know because nothing was submitted.

As a result of the accident and follow-on EUMRs, action was taken by the prime AMA to issue a TCTO requiring the collar handles be indexed in a straight aft position rather than the 53 degree position. This provides protection to the cam on the crank handle when dropped or dragged on the concrete. The technical order for the nozzle was rewritten to include detailed operating and inspection instructions; it also explains the locking mechanism for the nozzle.

The point we want to make here is, do not wait until an accident occurs before you submit EUMRs or AFTO Forms 22. If you have unsatisfactory material or inadequate technical data, report it or someone else may make the report for you. ★

FUEL SERVICING CONTROLS

MAJOR DWIGHT BROWN, JR., SAAMA, Kelly AFB, Texas

Last year a cargo plane took off from an enroute stop for a flight to its home base. It never made it. The aircraft could only manage 400 feet of altitude before the aircraft commander gave the order to prepare for a crash landing. The plane crashed and burned. Fortunately, the crew escaped without injury.

What caused this accident? Would you believe the aircraft had been serviced with the wrong grade of fuel? Murphy's Law had been successfully applied again.

Something needed to be done. Positive steps had to be taken to insure that the proper grade of fuel is issued to aircraft. The command owning the destroyed aircraft recommended that SAAMA host a meeting of major command fuels personnel with a view toward improving current control procedures. The Quality Division of SAAMA hosted the Fuel Servicing Control Meeting 3-4 December 1970 at Kelly AFB, Texas.

Realizing that the human factor is the cause of most accidents, the conferees focused on mechanical improvements to refueling hardware that would lessen the chance of personnel error. During the two-day conference, every aspect of fuels operations was covered, from the time fuel is received on base until it is issued to the aircraft.

In many functional areas the idea of supplementing human judgment by the use of various mechanical devices has resulted in reduced errors. This principle was applied to refueling operations. The first step in approaching the goal was to provide standardization in all refueling operations. This led to the decision to fill all refueling units from the bottom or "bottom loading"—the term used by fuels people.

Bottom loading not only provides a means of preventing the commingling of fuel, but also results in improved safety of operations, and aids in maintaining the quality of aviation fuels. To achieve the desired reliability, it was necessary to make botton loading connections on vehicles and fixed facilities distinctively different. This was accomplished by adopting the standard single point nozzle and receptacle for JP-4 and a dry break type coupling valve with adapter for avgas. *With these two different systems it will be virtually impossible to bottom load the wrong grade of fuel into a refueling unit.*

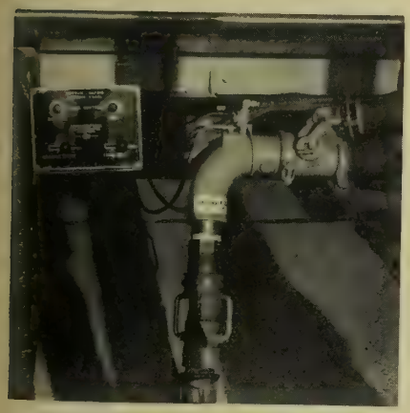
WRAMA, the Vehicle Item Manager, is in the process of publishing TCTOs for all types of aviation re-



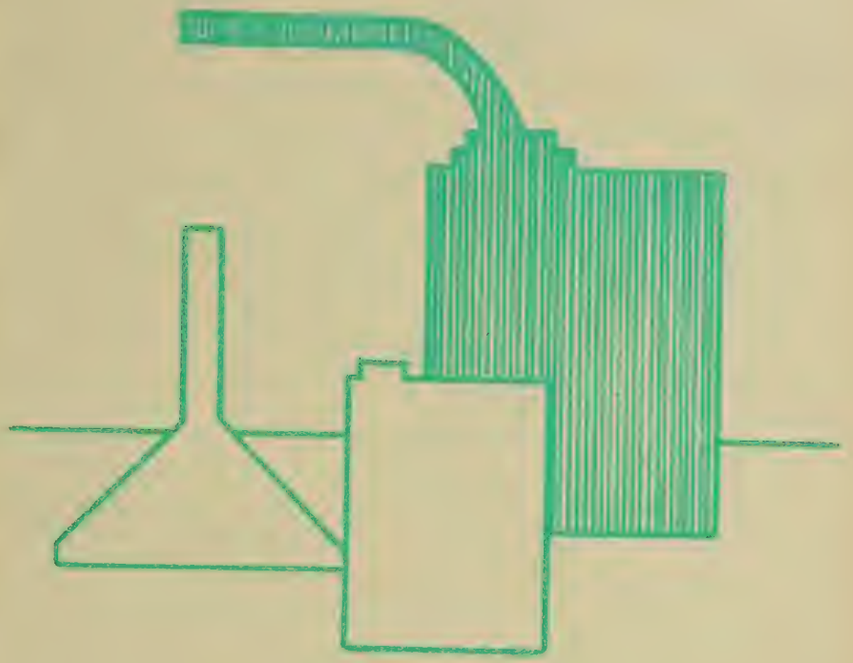
Note the standard single point nozzle will not fit the dry break type coupling.



Bottom load hook-up for JP-4.



Bottom load hook-up for avgas.



fueling units with a compliance date of 90 days from date of issue or 30 days from receipt of parts, whichever is later. You should see these soon.

Pending conversion of all units to bottom loading, a lock control system will be required for avgas vehicles. Padlocks will be on truck domes with keys suspended from the fillstands. This locking system will be mandatory at those few bases that have a need to retain a top loading capability. TO 42B-1-1 is being revised to eliminate the lock control system for *fillstand* operations once bottom loading modifications of refueling units and fillstands are complete. Any deviation from bottom loading will require a waiver from HQ USAF.

A further safeguard is the use of the paper chromatography test outlined in TO 42B-1-1SS-2, issued last October. The test, which will be applied to storage operations, will detect the slightest degree of avgas contamination by jet fuel. This testing procedure will be used to verify that a bulk storage tank has not been contaminated by subsequent receipts of fuel. Tanks that have received fuel will be checked against a reference fuel before the storage tank can be released for issue to fillstands or hydrant systems.

Two additional administrative procedures were implemented to complement the changes in the mechanical portion of the systems. Instructions in AFLC CMAL (Control Multiple Address Letter) No. 71-5 require verification that the right grade of fuel was issued to the refueling unit, and refueling unit markings identify the correct grade of fuel for the aircraft being serviced.

In addition, the lock control system for refueling units presently outlined in TO 42B-1-1 will be retained. This system requires locking of refueling unit access doors or primary control valves which must be opened to permit fuel servicing. The conference went one step further and recommended that the location of the lock be standardized for each type of refueling unit.

The servicing controls adopted by the conference were the optimum methods available to insure that aircraft are serviced with the proper grade of fuel. With these procedures and sound management practices, Murphy's Law will be a thing of the past in refueling operations. ★

FLIGHT LINE SAFETY

EXPLOSIVES SAFETY

JOHN H. KAWKA
Directorate of Aerospace Safety

Accident reports show that most explosives mishaps occur on the flightline, and that half of these are caused by personnel error. This is why flightline activities must be included in unit explosives safety programs.

The danger comes from errors made not only by munitions people but by others involved with munition-carrying aircraft containing munitions. A communication specialist can blow a canopy, a mechanic can salvo bombs, and just about anyone can inadvertently expend one of the many electroexplosive devices used on our aircraft—to name but a few of the possibilities. This is one reason why TO 11A-1-41 (Explosives Safety Surveys) requires the surveying officer to report the effectiveness of command support for explosives safety in the organization, including the method of communication between him and the commander.

Since the commander cannot delegate his responsibilities for explosives safety, yet cannot be present in all areas, he takes the next best step and delegates his authority for explosives safety to his explosives safety officer. His explosives safety officer must identify operations having an accident potential in handling, storage, loading, transporting and use of explosives in order to keep his commander informed on the action taken and recommended to minimize these potential hazards.

When the explosives safety officer finds a deficiency, he should bring it to the attention of the supervisor involved, recommend corrective action, follow up to see that corrective action has been taken, and keep the commander informed. However, surveys and Unit Effectiveness Inspections indicate that while many explosives safety officers are surveying their munitions storage areas and insuring proper safety measures there, they don't always survey their flightlines and egress shops. How, then, can they be effective in applying the commander's delegated authority? Further, how can they keep their commander informed of the actions he needs to take to preclude explosives accidents?

To make his commander's position of responsibility more tenable and his own position of authority more effective, the explosives safety officer should make regular checks and monthly surveys of the entire flightline (including checks of the loading and handling of aircraft containing explosives) to insure that:

- Munitions loading crews are certified and thoroughly familiar with the aircraft, its load, requirements and the proper conditions or equipment required during loading.
- All flightline personnel are briefed that only qualified and certified munitions load crews are authorized and permitted to handle munitions and that they must thoroughly understand their duties.
- Munitions load crews adhere to prescribed procedures during all operations involving explosives.
- Munitions are returned to the storage area immediately when no longer needed.
- Positive control of munitions is maintained at all times—especially on the flightline.
- Preflight loading and unloading are conducted as prescribed in the applicable Dash-1, Dash-2, and checklists for the aircraft and munitions to be loaded.
- Competent personnel inspect the aircraft to make sure that no munitions are aboard prior to maintenance and that armament circuits are deenergized prior to preflight.

In addition to the checks made on the flightline itself, the explosives safety officer should make regular checks of the egress shop to insure that:

- Approved standing operating procedures are on hand and being followed.
- Propellant actuated devices are within their time-change limits.
- Mockup trainers are available and being used.
- Behind-the-line supervisors and other involved personnel are briefed on the hazards of the various ejection systems for all assigned aircraft.
- Propellant actuated devices are not being stored within the egress shop, except for the minimum necessary to support each operation.
- Flight status safety pins and streamers are being used and are serviceable.
- Ejection systems on all aircraft in hangars have been safetied by egress specialists.

These safety precautions should be supplemented locally as necessary to assure safe on-the-line operations.

Explosives flightline mishaps can be greatly reduced if the explosives safety officer assists all flightline managers to develop and maintain a well directed explosives safety effort actively supported by the commander. To protect the flightline and other resources from explosives mishaps, the commander should make sure he has an active, effective explosives safety education and promotion program backed up by frequent observations, followup and supervisory enforcement. ★



Toots

is interested in your problems. She spends her time researching questions about Tech Orders and directives. Write her c/o Editor (IGDSEA), Dep IG for Insp & Safety, Norton AFB CA 92409

Dear Toots

Your question and answer article in the December ssue stimulated quite a bit of discussion about the Exceptional Release. Since you have managed to keep us out of trouble in the past with your excellent guidance, we return to you for advice.

Para 2-62c of TO 00-20-5 states in part, "When an exceptional release is signed by a maintenance officer, it will not require another signature for that calendar day unless additional *uncleared* red symbol discrepancies are encountered." Para 2-62c(3) of the same tech order states, "to indicate what outstanding items are to be covered by the exceptional release, the crew chief will draw a red line under the *last* entry on the AFTO Form 781A. When the release is signed, the releaser will place his initials at the left hand margin on the AFTO Form 781A beside the red line entry."

Here is our question: An aircraft is released for flight by a maintenance officer, the status today in block 11, box 3 indicates the status is a red diagonal. The maintenance officer signs on line 1 for the red diagonal in box 3. The aircraft flies a mission and lands with a minor discrepancy. The crew chief puts a red diagonal on this discrepancy. Maintenance personnel clear the defect and the aircraft is ready to fly again (same calendar day). Is another release required and is it necessary to draw another red line on the AFTO Form 781A? If so, who initials it?

In another case, the same aircraft lands with a major defect, a red X. The status today is changed to a red X in block 11, maintenance again clears the defect and the aircraft is ready to fly (same calendar day). The status today in block 11 is changed back to a red daigonal. The status of the aircraft is now the same as when the maintenance officer first released it, there are no additional uncleared red symbol discrepancies. Again is another release required and another red line on the AFTO Form 781A?

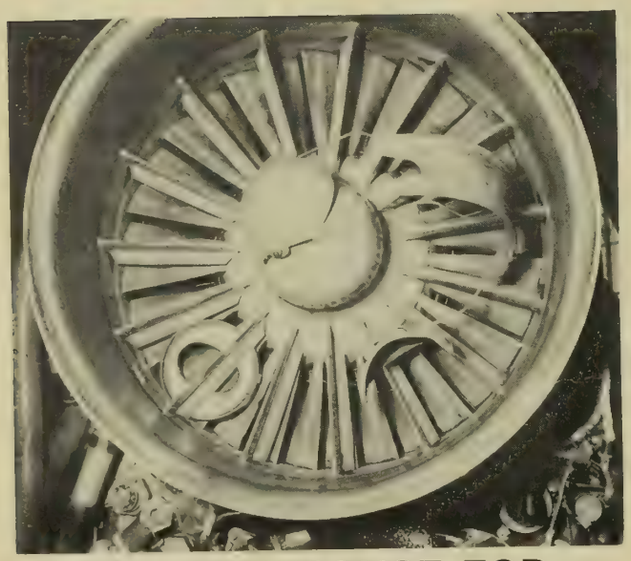
CMSgt George H. Westerfelhaus
376 Strategic Wing
APO San Francisco 96239

Dear Chief

I presented your question to the OPR for TO 00-20-5. They feel it is a valid question and request you submit an AFTO 22 with your suggestions as to how to change the TO. They interpret the TO, as it is presently written, as follows: As long as the status today, block 11, 781H, does not change, a new release will not be necessary. If the discrepancy was a red X, then the status today, block 11, would have to change, which, in turn, would require a new exceptional release.

Toots

Ops topics



MICKEY MOUSE FOD

The ground crewman was performing a "last chance" inspection on a T-38 waiting to take the active runway. He finished his check in the right wheel well area and headed for the nosewheel area, leaving the underside of the aircraft just forward of the right wing. A gust of wind caught him and threw him off balance, and the hood of his parka was drawn into the engine intake. The crewman pulled free, but in so doing his "Mickey Mouse Muff" ear protectors were dislodged and ingested. The engine was shut down, but too late to prevent compressor damage.

Wind at the time was 23 knots, gusting to 30, and the engines were at idle RPM.

We can't over-emphasize that these giant vacuum cleaners we deal with can be dangerous. If your job takes you near an operating jet engine, give a little thought to maintaining safe clearance from the intakes —it might save your life, and a heck of a lot of money.

RUFFLED T-BIRD

The mission was transition training, with an IP in the back of the T-33 and a pilot undergoing initial qualification in the front. After some work in the transition area, they brought the bird back to the field for some practice SFO landings. The first two approaches and landings were normal, and the third approach was broken off for conflicting traffic. The IP wasn't satisfied with his student's airspeed control and use of flaps, and demonstrated the fourth approach and landing, stressing those items, then gave the airplane back to the pilot for another approach. Gear and speed brakes were extended at high key (7000 feet), and flaps set at 20 degrees. Full flaps were set at the 270 degree point, as the aircraft was a bit high, but the pilot didn't lower the nose enough to compensate for the additional drag of the flaps. On final the airspeed decayed to 125 knots and the bird developed a rapid sink rate. The IP reminded the pilot to monitor airspeed, then took control of the bird when the airspeed went through 120, and applied full power—just before the airplane touched down in the overrun, in a right crab, right-wing low. Inspection disclosed more than two kilobucks worth of damage to the left gear door, strut and wheel rim.

Anybody who's been an IP for a while knows the value of letting a student learn from his own mistakes —but it's all too easy to get behind. Stay Alert!

TWO GOOD SAVES

We do a lot of jawing about the way we dumb old pilots bend up our machinery. It's a real pleasure to break a trend and report on a couple of steely-eyed jocks who wouldn't let the gremlins get to them.

• The F-4 was in the soup on GCA final when the pitot-static instruments started disagreeing with the ADI presentation. The pilot immediately made a partial panel recovery to "on top." Once in the clear, the ADI appeared to be working normally. The pilot suspected a bad case of vertigo and declared an emergency. Another F-4 in the area joined up with him and brought him in for an uneventful wing landing. When the ADI was bench checked it was found to be sticking in pitch and roll.

In another part of the world, crew coordination saved the day.

• The attitude indicator in the front seat of the F-4 froze at 30 degrees of bank, although pitch and azimuth indications appeared normal. Standby was selected and the ADI recovered. Rear seat indications were normal. Shortly thereafter another turn was entered and the ADI froze straight and level. This time switching from standby to primary righted the ADI and, again, no malfunction occurred in the rear cockpit. The mission

was completed with the back seater relaying all his attitude indications to the front seat. If any deviations were noticed, the reference selector was switched from primary to standby (or vice versa). In all cases this freed the ADI and righted it.

In each case, superior skill and cunning paid off and what might have ended as a tragedy became an incident. These pilots, and the thousands like them all over the world, deserve a pat on the back for taking up where the machine left off.

PALLET ERROR

The C-123 was scheduled for a high-speed taxi check to resolve a discrepancy between static and in-flight engine performance. When the pilot and copilot arrived at the aircraft, flight line personnel informed them that the aircraft was ready to go and that a flight engineer would not be going with them. The pilot instructed the copilot to perform the exterior walk-around inspection while he made the interior inspection. The pilot stated that he noticed a loaded cargo pallet in the rear of the aircraft, but assumed it was secured.

The crew started engines and taxied to the active for their full power taxi check. Shortly after releasing brakes they heard a slight noise in the cargo compartment, but neither pilot thought it was significant. The crew accelerated the aircraft to 90 knots, then retarded throttles and reversed engines. Immediately after reversing, the crew heard a loud bang in the aft compartment, and the copilot reported that the pallet was resting against the forward bulkhead. (Good thing the bulkhead was there—the pallet weighed two and one-half tons!)

The primary cause was assessed as operator factor, in that the pilot ignored his checklist and left the pallet unsecured. Supervisory error contributed, in that local instructions require that cargo be downloaded and fuel reduced to minimum for high-speed taxi tests.

In addition to the more obvious corrective actions, this unit now requires that high-speed taxi tests be monitored by quality control personnel.

F-4 SWITCH MOD

The OOAMA Configuration Control Board has approved a modification to F/RF-4C/D/E aircraft to relocate the primary/standby switch from the compass controller in the right console (aft) to the pilot's main instrument. Purpose is to eliminate the possibility of the pilot experiencing vertigo or spatial disorientation when switching from the primary to standby system for aircraft attitude reference presentation on the ADI. Installation is expected to begin 1 August.

FLIP CHANGES

Daylight Saving Time: As you know Daylight Saving Time is in effect until 0200, local daylight time, 31 October 1971, in the conterminous United States, except Arizona and Michigan. To avoid confusion, a new method of depicting times which reflects the minus one hour change in zulu time caused by the implementation of Daylight Saving Time has been included in the United States IFR and VFR Supplements.

All times will continue to be referenced to Greenwich Mean Time (GMT) corresponding to local standard time. However, for those airdromes/facilities located in areas where Daylight Saving Time is in effect, the zulu time corresponding to local Daylight Saving Time follows in parenthesis, e.g., Field Attended 1100-1500 Z (DT 1000-1400 Z)

Taipei Blow-Up: Effective with the 29 April 1971 Pacific and S.E. Asia FLIP Enroute Charts, a new terminal area chart of Taipei has been added to Chart T-2 which will improve the depiction of the Taipei area. ★

STARVED T-BIRD

After a delay of approximately 20 minutes in the number 1 position, the T-Bird pilot was cleared for takeoff. When the throttle was advanced for engine check, the ol' J-33 protested, coughed and quit. As the RPM went through 26 percent the pilot stopcocked. T-33 drivers can guess this one—there was no fuel in the fuselage tank.

This is not the first time a T-33 has been starved for fuel at this point, but hopefully it will be the last. Check your gages after a prolonged wait on the ground. We wonder if the low level fuel light was on. ★



MAIL CALL

Well done, AFRES

We at Headquarters Air Force Reserve were proud to see an aircrew in one of our units, the 992nd Tactical Airlift Group, Kelly AFB, Texas, singled out for recognition for their "professionalism and excellent aircrew coordination" in a hazardous situation.

The USAF Well Done Award which they received is a measure of their outstanding airmanship and performance in the critical situation described in the citation, appearing in the February 1971 issue of *Aerospace Safety*.

It's ironic, though, that the Reserve unit they were airdropping from their C-119s, the Texas Army National Guard was correctly identified, but no mention was made in the account that the safety-conscious crewmembers are Air Force Reservists. This fact makes their achievement all the more noteworthy, since these Citizen-Airmen are not normally full-time flyers and fly older aircraft.

Lt Col Ernest L. Burney, Jr
AFRES (SE)
Robins AFB, Georgia

Failure to communicate

In reading your February 1971 issue of *Aerospace Safety*, I came across a mistake on page 20 concerning a movie personality. The article concerned the pulse plug break pins on the F-104G aircraft.

The statement, "What we have here is a failure to communicate," was not said by Steve McQueen but by Paul Newman, in *Cool Hand Luke*.

Unfortunately, since I am an aeromedical technician A90150, I am sometimes lost when I read some of your more technical articles. However, being in such close contact with flying personnel, I enjoy reading *Aerospace Safety*. I find your articles very interesting and very helpful, especially when it comes to discussions with flying personnel concerning their functions as aircrew members.

May I also add that, in my opinion, your articles are written and edited for both easy reading and enjoyability.

Sgt Frank B. Chavez, Jr
USAF Hospital
Vandenberg AFB, Calif.

Our apologies to Mr. Newman—or Cool Hand Luke.

A thousand combat missions??

I read General King's fine farewell message to his fellow pilots in your equally fine February '71 issue, and wondered about his opening phrase: "About thirty years and a thousand combat missions ago. . . ." I learned long ago not to bet into another man's raise, unless I had at least three Aces—but I'd be tempted to call and wait for the last card on this one.

I flew combat in the old, slow conventional types, back when fifty missions were good for a ticket back home—and some of those who got their fifty arrived home alive.

My question is, did the General use that phrase, ". . . a thousand combat missions. . . ," as a jesting way to denote a helluva lot of missions, or did he actually survive a thousand? If so, he should live to be at least 100; somebody "up there" must love that guy!

Also, I'd like to pass on my congrats to the General for having flown all types of kites for 30 years without being tagged for a personal-error accident. Every jock should tack a copy of his sage advice: "Know your machine and its capabilities, **and** know your capabilities —exceed neither," upon the wall and read it each morning. General King's retirement is the Air Force's loss. They should re-hire him as a flying instructor.

Worried Old Timer (Retired)

General Ben King did indeed have a thousand combat missions (and probably more), flown during three combat tours in WWII, Korea and a couple of tours in SEA. We agree, when General King retired, we lost not only a fine combat pilot but a great leader as well.

☆ U.S. GOVERNMENT PRINTING OFFICE 1971 431-464/9

UNITED STATES AIR FORCE

WELL DONE AWARD

Presented for outstanding airmanship and professional performance during a hazardous situation and for a significant contribution to the United States Air Force Accident Prevention Program.

MAJOR
Ronald G. Standerfer



108 Tactical Fighter Wing, ANG, Atlantic City, N. J.

During TDY in student status to the 419 Tactical Fighter Training Squadron, McConnell AFB, Kansas, Major Standerfer's rapid evaluation of an emergency and calm, decisive action saved a valuable F-105D. While flying number two on a formation GCA missed approach at 200 feet, his engine flamed out. Major Standerfer immediately zoomed his aircraft and attempted a restart by selecting the emergency fuel control. As he approached decision altitude and airspeed for ejection, the engine compressor stalled violently several times, then began to accelerate. By matching throttle position with actual RPM, he brought the engine under control and accelerated to military power. Major Standerfer then notified the instructor pilot of his difficulty and turned downwind for a landing. On downwind he restored his airspeed and, using a precautionary landing pattern, touched down without further incident. Maintenance investigation revealed that the main fuel control had failed internally, causing the flameout.

Although Major Standerfer had less than six total hours in the F-105, his precise assessment of this serious inflight emergency and prompt corrective actions averted a major accident. WELL DONE! ★

PLAY SAFE

OPERATION

SUMMER ATTACK

1 APR–30 SE

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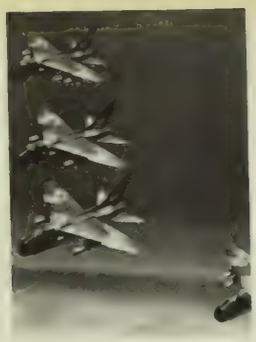
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COVER PHOTOGRAPH BY TSGT EDDIE P. BOAZ, AEROSPACE AUDIO VISUAL SERVICE.

UNITED STATES AIR FORCE

JUNE 19

Aerospace SAFETY

FOR AIRCREWS, MAINTENANCE & SUPPORT TECHNICIANS

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Inspector General, USAF

MAJ GEN EDWARD M. NICHOLS, JR.
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DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USA

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JUNE 1971 AFRP 127-2 VOLUME 27 NUMBER



they said it couldn't be done

LT COL LARRY T. COOPER
Directorate of Aerospace Safety

Is it possible to operate a large fleet of jet aircraft for one year with brand new student pilots, fly almost a half million hours, and log almost a million landings without a major accident? Many folks within the aviation community would answer this question with a firm negative. Others might say that the irreducible minimum (a small number of accidents slightly above zero) has already been achieved.

Well, ATC recently confounded everyone. As of 1 May 1971, the US Air Force T-37 trainer fleet completed one year without a major aircraft accident. Since 1 May 1970, the fleet of 800 aircraft (all assigned to twelve ATC bases) flew 488,600 hours on 389,678 sorties and logged 970,298 landings. This number of hours without an accident may not be impressive to some transport or bomber units, but considering the number of sorties and landings, the T-37 achievement becomes more meaningful.

In order to put this accomplishment in better perspective, consider that during this period some 4909 student pilots successfully completed T-37 training. That's a bunch of students. When you consider the fact that most of them had only 16 to 30 hours light aircraft time (T-41) prior to the T-37, and the "tweety bird" was their first jet aircraft, the achievement is even more significant.

It required outstanding maintenance practices on everyone's part, from the crew chief and specialist to the highest level of supervision. And let's not forget the flying safety officers who established outstanding safety programs at every base.

This remarkable achievement could not have been possible without the very best of command control and supervision; maintenance; training; standardization; operational procedures; pilot discipline; and support activities at all levels. Every officer, airman, and civilian associated with the T-37 program is to be congratulated. They have proved that it can be done. ★

management and command responsibility for

PILOT FATIGUE



PILOT FACTOR, lack of judgment, false pride, crew rest, eight hours of uninterrupted rest, alertness, progressive unconscious lowering of performance standards—all words addressing fatigue associated accidents. Mountains of articles and words have been written about this subject, many by authors who have not experienced nor even ventured into the real world of the deployed aviator. To whom do they direct most of these articles in the cause of accident prevention? Yes, to the pilot. Consequently, the pilot eventually becomes inured to these constant exhortations on a subject which is not always under his control. A great wash of euphoric platitudes falls on deaf ears when the written admonishment belies the situation.

The often overlooked problem of fatigue is not only a responsibility of the individual, but of command. It is quite simple to blame the pilot, although the pilot's unfortunate experience may have been a result of what he thought was aggressive, unflagging devotion to duty. Therefore, it is a necessity for those in authority to be cognizant of fatigue potential. Factors influencing pilot fatigue are generally well known—individual physical fitness, time of day, type of operation, length of flight, landing platform, weather, conscientiousness in performing primary and collateral duties, state of training, degree of experience, rest, rest environment . . . to name a few. Additionally, poor morale and a resultant lack of motivation create a strain which makes an individual much more susceptible to fatigue.

These multiple factors interact in varying degrees on different individuals, consequently the fatigue factor cannot be compared by one in command as to how he might feel. Moreover, the commander may feel impelled to drive his personnel even harder as the pressures and commitments rise. Some staff planners and managers who were once the operators may lose sight of the requirements and actualities involved in producing certain desired functions. The squadron may reach a point where it no longer has sufficient time for flying, duties and rest. Not only does fatigue ensue, but hasty action may accompany it. Not only do the pilots show the strain, but it becomes evident in the men.

THE LEADERS within some of these operating organizations advise their people to catch a nap when the opportunity allows. In "Space Medicine" Armstrong notes that physical fatigue may be alleviated by a brief nap but mental fatigue is not significantly reduced without a relatively prolonged period of sound sleep. But the pace established under the foregoing circumstances eliminates any possibility of proper rest.

It is not unusual within the military to sustain a high tempo of operations while overlooking the effect on participating individuals. A blind "can-do" attitude is dangerous, ill-advised, and uncalled for. "Can-do" is an essential element under the right set of circumstances; however, it should not become the daily standard because it sacrifices efficiency, safety and material condition of equipment. To maintain such a pace when pilots are flying and working far beyond reasonable standards and maintenance personnel are pushing themselves into a state of exhaustion can and frequently does prove expensive. The pilot eventually becomes overextended physically and mentally. He is subjected to the pressure of accelerated flight ops and a total increase in work load for such reasons as short training cycles, impromptu scheduling, competition, poor availability of aircraft and parts, questionable training for training's sake, desire on the part of some individuals to make their mark and a variety of other valid and invalid circumstances. As a consequence, the deleterious effects of fatigue may frequently be overlooked by the planners, the managers, the commanders, and the pilot himself. Since fatigue is difficult to recognize, and may be no more tangible than a flight surgeon's training lecture, the cumulative result in extreme cases can be outright lethargy, wherein even the inherent desire for survival is depressed.

ALL COMMANDERS must consider the implications and consequences of fatigue in accelerated and extended operations, and in those operations during which exceptionally exacting demands are made on individuals.

Additionally, it is felt that better long-range planning and anticipation are necessary to avoid periods of accelerated operations and ensure a more even distribution of the workload. This workload must be scrutinized critically for fatigue inducements and these possibilities must be eliminated or reduced wherever and whenever possible. The breakdown of planning must be avoided. Otherwise factors begin to interfere with the current operation to the degree that the pressure is on.

There has always been a stigma attached to the slightest lack of a hard-charging, overzealous "can-do" attitude. This stigma will never be eliminated. Therefore, exhortations that individuals recognize and admit fatigue accomplish little. Senior commanders must provide limitations for the operating commander during accelerated operational training periods, considering the personnel and material means at their command. Under military commitment operations, the chain of command must include fatigue considerations in their planning for mishap prevention.

It is incumbent upon the commander, the supervisors and a man's own friends in the operating unit to be alert for fatigue in individuals and to promptly cope with it. The fatigued individual should not be queried as to his capability for continued activity, for his answer will generally be of the "can-do" variety. He must be cancelled from the flight schedule, or told to hit the sack and get some rest.

Positive, realistic action at all levels of planning and supervision is required to minimize hazards and prevent occurrence of fatigue factor accidents.

(WEEKLY SUMMARY, U.S. Naval Safety Center)

REDUNDANCY ALONE

LT COL DAVID L. ELLIOTT, Directorate of Aerospace Safety



The following concerns an aircraft accident in which two barriers, back to back, failed to save an aircraft.

The hook of the accident aircraft was observed to be down about 2000 feet prior to crossing the BAK-12 cable. The hook struck the top of the cable about 2.5 feet to the right of the runway centerline, cutting several strands and leaving an imprint of the hook on the cable. The aircraft then passed over the barrier and headed for the MA-1 cable.

By this time the aircraft was traveling at about 100 knots, at a gross weight of approximately 41,800 pounds. The arresting hook engaged the MA-1A cable about 3.5 feet to the right of the centerline. The engagement was initially successful; however, shortly after the engagement the cable failed. The aircraft was destroyed.

The accident board observed several successful barrier engagements on the BAK-12 system after the accident. The hooks of these aircraft were observed to track well with only minor bouncing on the runway. This indicated that, properly engaged, the BAK-12 would have arrested the accident aircraft. There was also no indication of a hoo failure. The hook pressure was mea sured at approximately 1000 pound after the accident.

Although the groove under th cable had been repaired two month earlier, the BAK-12 cable had wor a new groove about ten inches wid and 1 7/16 inches deep at the run way centerline. These measurement were determined during a groovin inspection made by the barrier cre three days prior to the acciden By coincidence, the cable clearin above the runway was also measure as 1 7/16 inches during this in spection. This is 1/16 inch les

ISN'T ENOUGH

than the minimum required by TO 35E8-2-5-1.

The accident investigation board concluded that the groove under the cable contributed to the unsuccessful BAK-12 engagement. The fact that the cable was rigged 1/16 inch below the minimum runway clearance required was considered a minor factor. The most probable cause was that as the aircraft wheels passed over the BAK-12 cable, fluctuations were induced and the cable was almost below the level of the runway as the hook arrived. Under this condition, with the cable partially within the groove, the accident aircraft hook deflected the cable down and under the hook.



The 175-foot long MA-1A barrier cable is attached to ship anchor chains. TO 35E8-2-2-4, dated 28 Mar 69, requires the chains to be connected to the swaged ends of the cable with a two-plate or "sandwich" type connection. However, on this particular MA-1A barrier, one end of the cable was found to have been connected to the chain with only a single plate. It failed at this point, shortly after engagement. This barrier had provided previous successful engagements, but could not withstand the load imposed by the accident aircraft due to the inadequate connection.

Increased reliability afforded by redundancy is based on the individual reliability of both the primary and backup systems. In this case the reliability of each barrier was low enough to assure, sooner or later, an unsuccessful engagement.

Grooving under barrier cables greatly increases the probability of an unsuccessful engagement. There will, of course, be successful engagements but once in a while a failure. In the case described, the failure did occur, a reliable MA-1A was not available as a backup and the aircraft was destroyed. This looked like an excellent barrier setup. However, once in a while the conditions will be right for just what happened here. ★



DANGEROUS C

CAPT ROBERT B. REESER
4650 Combat Support Sq.
Richards-Gebaur AFB, Mo.



Have you ever violated a regulation? While thinking over the necessary rationalization to answer that question, let's make it more specific: Have you ever violated one, the violation of which must be reported to HQ USAF by priority message?

Let's shelve this question for a minute and ask another: What are dangerous materials? Obviously, explosives are dangerous materials. There are others, and their "dangerous" characteristics are fairly obvious. Or are they? Air Force Manual 71-4, "Packaging and Handling of Dangerous Materials for Transportation by Military Aircraft," defines dangerous materials: "Any material that, because of its properties, is flammable, corrosive, an oxidizing agent, explosive, toxic, radioactive, or unduly magnetic." (Unduly magnetic is construed to mean that sufficient magnetic field strength is present to cause significant navigational deviations to the compass sensing devices of an aircraft.) (AFM 71-4, Chapter 1, Para 1-1, f.)

With this definition in mind, the obviousness of the "dangerous" characteristics becomes questionable. Some of the less obvious items that are included under dangerous materials are carbon remover, liquid cement, cleaning compound, gasoline, lighter fluid, aerospace ground equipment with fuel in tanks, radar magnetrons, wet plate batteries, some paints, some motion picture film, aircraft magneto assemblies, and hydraulic brake fluid, just to mention a few.

Perhaps you agree with this list, and are familiar with the packaging and labeling requirements of AFM 71-4. Perhaps you, as an aircraft commander, take all the necessary steps to insure that these items, when part of your aircraft cargo, are inspected to assure compliance with requirements of AFM 71-4. Your responsibilities, however, do not stop here.

You, the aircraft commander, are also responsible in part for compliance with AFR 55-14, "Operational Procedures for Aircraft Carrying Dangerous Materials as Cargo." This regulation assigns responsibilities to major commands, base commanders and aircraft commanders. One of the aircraft commander's responsibilities is to accomplish the backup notification procedures, contained in paragraph 4. This consists primarily of identifying your cargo in the "Remarks" section of the DD Form 175 as "dangerous" along with necessary description and instructions.

Another aircraft commander responsibility is to notify, by telephone, the first base of arrival of the nature of his cargo, if the planned ETE is less than one hour.

As a final backup, you must verify receipt of your dangerous cargo message with approach control or tower at least 10 minutes before your actual arrival.

GO "hot" or "cold"

Now that we've briefly looked at a few of the requirements of AFR 55-14, let's look at paragraph 7, the last one in this regulation: "Landing Without Advance Notification." "When a commander is advised that an aircraft carrying dangerous material has landed without advance notification or that the control tower was not notified as required in paragraph 4, he will advise the applicable service headquarters by priority message."

Assuming that there have been violations of AFR 55-14 (and there have), and that some of these have been willful violations, the natural question which arises is "WHY?"

To answer this question, follow Captain Joe Goodguy as he attempts to fly a mission with dangerous cargo on board, "by the book." When he picks up his cargo, he and his loadmaster inspect the cargo for compliance with AFM 71-4. In this case it is fairly simple, a radar magnetron for a fighter aircraft. The box has been properly marked and labeled. Joe knows that his command post has sent the required predeparture message IAW AFR 55-14. He enters the proper statement in the "Remarks" section of his DD Form 175. The ETE for the flight is more than one hour, so he does not have to make a telephone call. The proposed flight plan was accepted by center, so there is nothing left for Joe to do except to confirm receipt of his message with approach control or the tower. Approach control does acknowledge receipt of the "dangerous cargo" message. Every special requirement of fulfilling his responsibilities for his cargo has been met so far.

On final approach, however, Joe notices the flashing red lights of some emergency vehicles at the approach end of the runway and on several adjoining taxiways. During his landing rollout, he becomes the leader of an interesting looking parade. Soon he is following a "Follow Me" out into the boondocks. He had requested minimum ground time, and is somewhat surprised to be taxiing to the South 40. He is parked in the "Hot Spot," that beloved area devoid of anything worthwhile, including any transportation to base operations. Eventually, after a lengthy wait for wheels, a lengthier wait for refueling, and being subsequently downloaded after air freight discovered his aircraft, Joe had to taxi to the main terminal area to make room for another aircraft with "hot" cargo. He did discover, after conversations with tower, ground and operations that he was parked in the boonies because of his "hot cargo." He showed operations personnel his copy of the DD Form 175, which identified his cargo as "dangerous," and further described it as "magnetic, isolated taxiing and parking not required." The reply given him was "All hot cargo onloads and offloads in the hot cargo area."

Mission Delay: More than one hour. Reason: Overreaction. Result: Guess what items Joe is not going to include in his DD Form 175 tomorrow with a similar load? Further result: Willful violation of AFR 55-14.

What is the solution? Joe sees an immediate one by no longer identifying his cargo as dangerous, unless he is carrying explosives. He is now caught in a vicious cycle: He will no longer call anything *dangerous* except for the more obvious items; base operations will receive no more "dangerous cargo" messages unless explosives are being carried. Therefore, receiving bases will continue to *overreact* to the lone aircraft commander who is the next to call a magnetron *dangerous*.

Again, what is the solution? Education and practice. Aircrews should be made aware of the requirements of AFR 55-14, coupled with a working knowledge of AFM 71-4. Base operations and tower personnel should be made aware of the same requirements and look for specific descriptions. "Dangerous Cargo —Magnetic," and "Dangerous Cargo—Class B Explosives" are not in the same category and do not require similar handling.

Finally, as in many other systems, practice makes perfect.

Aircrews, after many flights with strict adherence to AFR 55-14, will no longer be gunshy of placing the required remarks on the flight plan. Ground personnel will no longer overreact to "Dangerous Cargo" arrival messages, being aware of the many types of dangerous cargo and their varying restrictions.

It all makes for safer operation. ★

THE I.P.I.S. APPROACH

By the USAF Instrument Pilot Instructor School, IATC/ Randolph AFB, Texas

INDEX TO IPIS APPROACH ARTICLES

Here's an index to all IPIS Approach items that have appeared in AEROSPACE SAFETY since inception of this feature in January 1965.

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MAY 68 Minimums for Approach
JUL 66 Winds (Magnetic Vs True)

Copies of all IPIS Approach articles to date are available from the USAF IPIS (FTYI), Randolph AFB, Texas 78148. ★

A-7 DEBRIS CONTROL

FOD continues to be a major Air Force headache. Here's how one manufacturer attacks the problem prior to delivery of a new aircraft.

Loose debris and/or foreign objects in aircraft offer one of the most common aircraft safety hazards. This problem is one of constant concern to Vought Aeronautics and that concern has led to the development of a Debris Control Plan. The purpose of this article is to describe the Vought Debris Control Plan and, hopefully, to promote a general understanding of the factors involved in limiting the incidence of foreign objects in our airplanes. The plan is based on keeping debris out of the aircraft from sub-assembly to pre-delivery, systematic removal of debris during the manufacturing process, redundant inspections, and constant updating of the plan by the continuous use of aircraft debris history.

Since debris-avoidance is more an attitude than a procedure, motivation has been periodically stimulated by showing all affected personnel a professional film produced by Vought Aeronautics. The film, which was made as a result of a debris-related inflight incident, is entitled "You Bet My Life"; it recently received a first place award at the Industrial Management Society industrial film competition in Chicago. It has also been provided for use by Customer personnel and other airframe manufacturers.

Aircraft compartment cleanliness is checked prior to every compartment closeout in subassembly, final assembly and at airport operations. In addition, a roll-over fixture is used to make hidden material accessible on the entire fuselage. Routine area inspections during airport operations are supplemented by x-ray of the cockpit area during Preflight Control Inspection and again during pre-delivery operations.

All foreign material that is found on the film by the x-ray technician is identified, listed on a Quality Assurance form, and accounted for to the satisfaction of Quality Assurance representatives.

Additional supplementary inspections during airport operations consist of "Cockpit Under Seat" inspections just prior to the first flight and again in Pre-delivery. This inspection is a visual check of the area under the seat, with high-intensity lights and mirrors through the rudder pedal and console accesses with the seat raised to the top of its travel.

The most extensive supplementary inspection is conducted after the initial flight of the aircraft and before the first Customer flight. This inspection has been named the "Negative G" check and is designed to remove all foreign material which

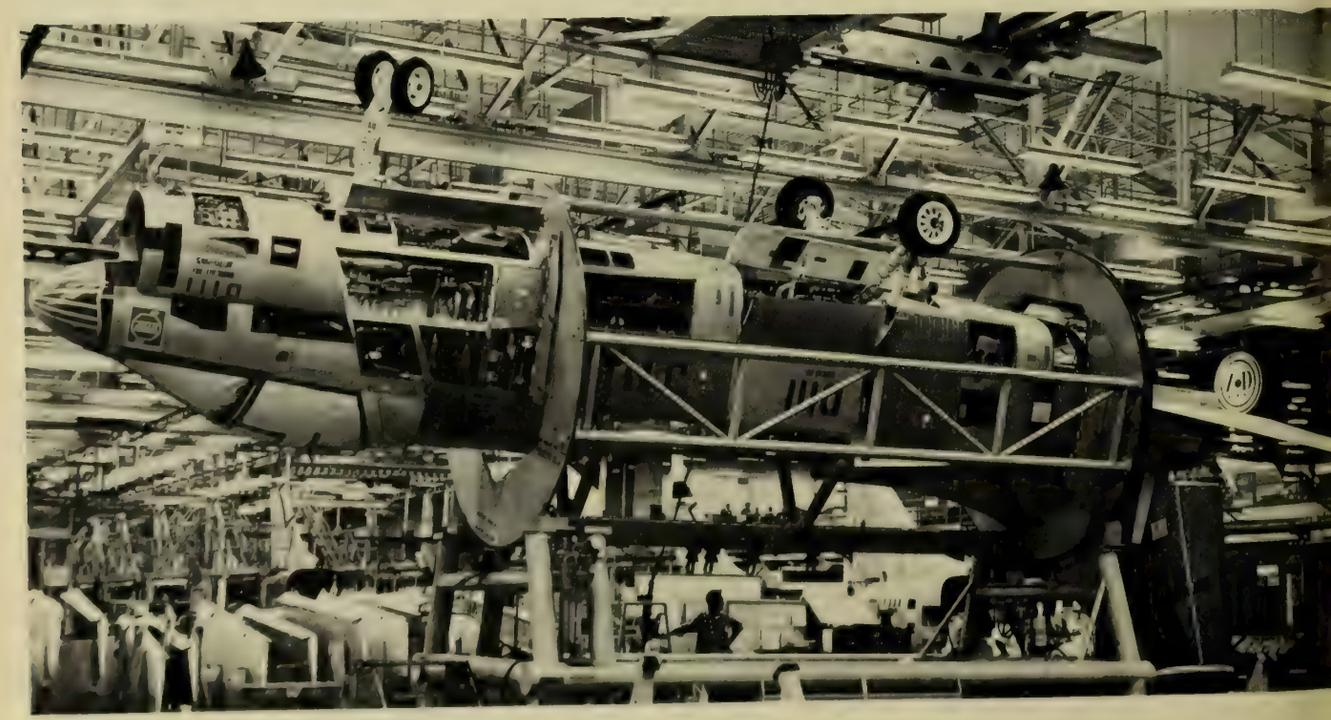


Figure 1. Roll-over Fixture



Figure 2. X-raying the Cockpit Area

has become accessible due to changes in gravitational force direction and magnitude during flight. The inspection is accomplished by opening approximately 60 critical areas and removing any foreign material which has been dislodged or made visible by the "Negative G" maneuvers.

During Pre-delivery operations, a special inspection is conducted to check the condition of certain critical compartments. This check measures the effectiveness of the debris control on the "as delivered" airplanes. Compartments are added to these checks when Customer reports indicate that excessive debris has been found in a delivered airplane. Similarly, compartments are deleted when inspection history indicates that the compartments are consistently acceptable when inspected during Predelivery operations.

The effort expended by Vought Aeronautics to control A-7 debris is only a beginning of the debris control effort which will be required to keep the aircraft clean. The problem of debris-avoidance exists throughout the "life" of every aircraft, as long as maintenance is performed by personnel using normal tools, techniques and hardware. Much can be achieved by motivation and training of personnel to prevent introduction of foreign objects. For this reason, Vought Aeronautics has not only rescheduled the showing of the film "You Bet My Life" to Vought Aeronautics Manufacturing and Quality Assurance personnel, but has also provided a copy of the film to various U.S. Navy activities and to the first U.S. Air Force A-7D Tactical Fighter Wing at Myrtle Beach AFB. ★

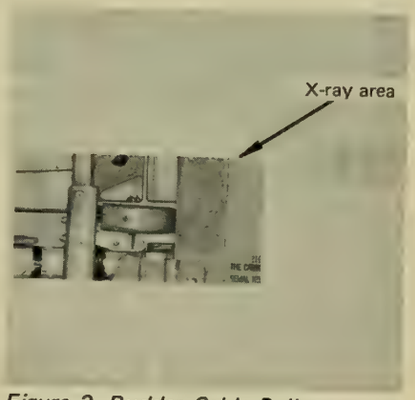


Figure 3, Rudder Cable Pulley Housing With Ejection Seat Removed

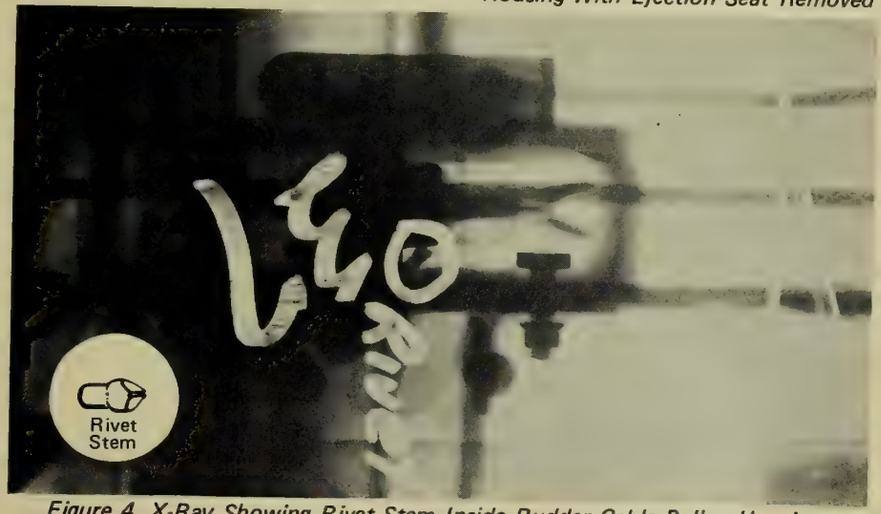


Figure 4, X-Ray Showing Rivet Stem Inside Rudder Cable Pulley Housing

(Reprinted from Vought Aeronautics Field Service MAINTENANCE DIGEST.)

PIREPS



expanding to fill the need....

In the sometimes vague and often confusing mass of weather information to which the pilot has access, there is one phrase which always catches our attention—PIREP. Here is on-the-spot, timely information from somebody who's *there,* and he's speaking—through the weather reporting system—in words we can understand.

PIREPs are enormously beneficial to the weather briefer. Benefits accrue not only from the on-the-spot character of the report—which makes it about as reliable as talk about the weather can ever be—but also from the timeliness—what the computer people call "real time" (which means *now).* In addition, PIREPs provide the sole source of

PIREPS PIREPS PIREPS

information on the *now* weather between ground reporting points.

Recognizing the need for incorporating this valuable information into our weather service program, the FAA has taken steps to improve and augment existing PIREP procedures, and launched an ambitious program of PIREP automation. First, though, let's take a look at what happens when you introduce a PIREP into the system—to an en route controller, for instance:

• The information is immediately available to pilots flying in the same area, provided they are in contact with ARTC. In addition, the controller passes the information to the Flight Service Station for that area.

• The FSS operator, whose primary duty is to brief pilots—both before and during flight—immediately incorporates the information in his briefings. He also passes the information along, via the teletypewriter net, to other Flight Service Stations and to the forecast office. In this way, your PIREP is rapidly and efficiently processed throughout the system, where all agencies, including our Pilot-Forecaster Service, have access to the information.

Still, there is much room for improvement and expansion. Recognizing this, the FAA has taken the following steps:

• An order has been issued to all tower chiefs at airports serviced by scheduled air carriers, requiring them to solicit airline cooperation in providing cloud base and top data whenever the ceiling is below 5000 feet overcast. At other airports, tower personnel have been directed to request this information at two-hour intervals from any aircraft under their control. Hopefully, pilots will also provide information on other significant weather, such as icing or turbulence.

• FSS personnel will solicit PIREPs when any of the following is occurring or forecast within the station's PIREP area: turbulence (including clear air turbulence of moderate or greater intensity); thunderstorms and related phenomena; visibility less than five miles; or ceilings below 5000 feet. CAT reports will be relayed to the ARTC center and transmitted on the weather teletypewriter circuit as an urgent PIREP.

In order to systematize the contribution of PIREPs, and make this valuable information readily available to all users, the FAA has established an experimental program along the following lines:

At selected VOR sites in the FAA Eastern Region, a receiver, recorder and transmitter will be installed. Two scheduled operators, whose planes regularly transit the selected VORs, have agreed to participate. When over the VOR, pilots for these selected airlines (one in the high altitude structure, one in the low) will transmit a PIREP in the blind on a discrete frequency. The PIREP will be automatically taped and rebroadcast continuously on the VOR frequency, and the associated FSS will copy the PIREP and disseminate it in the normal manner. When the next report is made, the previous report will be automatically erased.

By the time this issue of the magazine goes to press, the first unit will have been installed at the Millville, New Jersey, VOR for a three-week test. If test results are good, three additional systems will be activated for a six-month test. Equipment being used in the tests is off-the-shelf, but a successful six-month test will result in the issuing of specifications for more sophisticated equipment.

Ultimately, of course, the system will be expanded nation-wide. And anyone headed toward a VOR will be provided with *now* information on the weather waiting for him. ★

(Based on a presentation by Mr W. H. Boatright, Chief of Flight Service Station Operations and Procedures Branch, Air Traffic Service.)

ASKING FOR IT

MAJ THOMAS D. MILLER
4454 CCr Tng Sq, Davis-Monthan AFB, Ariz.

The many flying regulations and restrictions imposed on us as aircrews by our higher echelons of command are generally initiated in the interest of safety to conserve our resources, both human and material. We in military flying must absorb and apply the knowledge gained from the experiences and mistakes of ourselves and others in our profession, in order to fly safely and effectively, whatever our mission may be. When we ignore directives and regulations, fail to use good common sense, attempt to fly beyond our capabilities, deviate from established emergency procedures, or inadequately flight plan, we are, in the vernacular, "Letting it all hang out" or "asking for it."



ALTHOUGH each type of aircraft has its own peculiarities, the fighter business probably offers a greater scope and range of accident potential than any other. In fighters the crew composition is smaller, speeds faster, altitudes higher, engines fewer, and much equipment inaccessible to the crew; in short, a very demanding mission which can only be accomplished effectively by a true professional. I am not implying that bomber, transport, tanker, trainer, or even base operations flying is a "piece of cake," by any means. Each requires its own unique skills to safely accomplish the mission.

The single cockpit pilot (A-7, F-5, F-100, F-106, F-102, etc.) probably has the most demanding flying job in the Air Force, thereby the greatest opportunity for personal error. He is his own pilot, copilot, navigator, weapons systems operator, air refueler, etc. The GIB, WSO, Nav, or IP in the rear seat of the F-4 helps take the load off the aircraft commander, thereby through good crew coordination producing a more effective combat aircrew. Operating a one- or two-man aircraft does not especially mean in itself that the mission is more hazardous or less safe. It just means that you are forced to be more aggressive and do more on your own to get safely from point A to point B without an unexpected stop in between.

Although this article is directed primarily at fighter pilots, it applies just as well to any other type of aircraft. Think back and recall the last time "You asked for it."

* * *

The Form 70 was *almost* finished but he was in a hurry, so he bugged out without completing it. Unexpected head winds left him no margin on fuel for the long hop and a suitable airfield was not within range when he flamed out. Only desert and mountains. **"He asked for it."**

* * *

He failed to check the 781 thoroughly. Missed the delayed discrepancies, lack of an inspector's signature on maintenance performed on his aircraft, and the absence of a fuel entry. Flamed out two miles after takeoff. **"He asked for it."**

* * *

The TACAN was out on the cross-country flight and the *inertial* wasn't too good either. Left engine oil pressure was also fluctuating. They decided to save the

writeups until they got home rather than have to RON at a base without maintenance for their type of aircraft. They were 40NM off track on the last leg home when the left engine froze. **"They asked for it."**

* * *

The destination base went below minimums and they didn't *really* have enough fuel to make it to their alternate. They almost made it, but **"They asked for it."**

* * *

The RTU student was very weak in the Air Refueling Phase, but since he was a lieutenant colonel, his captain instructor pilot let him get through with a few words of warning. One month later, the former student had to bail out returning from a combat mission because he could not make a tanker hook-up. **"They asked for it."**

* * *

The young pilot was impressing his rear seater with his skill at flying low level. They scraped off their external tanks, the tips of the slab, and had tree limbs imbedded in the pylons when they landed. They were lucky! **"They asked for it."**

* * *

As the pilot rolled in for a heavyweight night dive bomb pass, he felt the aircraft shudder, ignored it, and continued to try to pull the pipper to the target. The altitude was too low to initiate a recovery from the spin. **"He asked for it."**

* * *

He forgot to change the switches between events on downwind during a night gunnery mission. Tried to do it turning base leg and got disoriented while looking at the DCU-94 on the right console. He made one swing in the chute before hitting the ground. Lucky? **"He asked for it."**

* * *

He had a bad head cold, but it seemed to be breaking up. Besides, he had to get a high altitude intercept mission in before the end of the half. On letdown he encountered severe sinus pains and an ear block resulting in a ruptured ear drum. **"He asked for it."**

* * *

If you've worked around aircraft for any time at all, I'm sure you can add many experiences of your own to the list. Many little errors eventually add up to back you into a corner, whether in the air or on the ground. Be professional in your flying and later they won't say about you—"Well, he asked for it!" ★

A BILINGUAL GLOSSARY FROM NEW ZEALAND ATC

Aircraft	Der fliegenwagen
Light aircraft	Der klienen fliegenwagen
Jet transport	Der gross fliegenwagen mit sckullschplitten schreemen spittenfirenbakof, ensmoken
Propeller	Der airfloggenfan
Control column	Der puschenpullen schtick
Rudder pedals	Der tailschwingen werks
Pilot	Der tailschwingen puschen pullen werker
Student pilot	Der dumbkopf lernen fliegen
Instructor	Der dumbkopf schtuk mit der dumbkopf lernen fliegen
Air traffic controller	Der schweinhund ubbenzie taur watchen aller oder dumbkopfs fliegen
IFR	Lissenwaitenhopen fliegen

(Journal of Air Traffic Control)

(CHINA-BURMA-INDIA)
HUMP PILOTS ASSOCIATION

26TH ANNUAL REUNION
RAMADA INN
COCOA BEACH, FLORIDA
AUGUST 19, 20, 21, 22, 1971

For Information Contact:
Dr. William Jackson
917 Pine Blvd.
Poplar Bluff, Missouri 63901
Telephone: (314) 785-4896

UNITED STA

1970 Saf



Secretary of the Air Force Safety Trophy

☆

TACTICAL AIR COMMAND

Best overall accident prevention program of all commands with 200,000 or more flying hours per calendar year.

TAC's well defined and effective accident prevention program reduced the command's major aircraft accident rate to a record low. TAC flew 700,000 hours while maintaining a combat ready status and supplying a continuous flow of skilled aircrews to Southeast Asia. The success of the command reflects strong leadership, effective management and a high degree of motivation among all TAC personnel.

☆

AIR FORCE COMMUNICATIONS SERVICE

Best overall accident prevention program of all commands with less than 200,000 flying hours per calendar year.

AFCS's aggressive accident prevention program attained a zero accident rate in both the major and minor flight accident categories, in addition to a zero explosives accident rate. This was the sixth consecutive accident-free year for the Air Force Communications Service, attesting to the high degree of professionalism within the command. In view of the diversity of the flying mission and the ground environment of the worldwide operation, the record of accomplishments was outstanding.

☆

Koren Kolligian, Jr., Trophy

LT COL ROY L. ST. MARTIN

The Koren Kolligian, Jr., Trophy has been awarded to Lieutenant Colonel Roy L. St. Martin in recognition of his outstanding feat of airmanship in successfully coping with an emergency while participating in aerial flight.

On 14 August 1970, Lieutenant Colonel St. Martin distinguished himself by displaying exceptional airmanship in coping with a unique and extremely critical system failure in an SR-71 aircraft. Consecutive failure of all redundant channels of the stability augmentation system placed the aircraft in an academically unflyable position from which loss of control, ejection, and subsequent loss of a valuable aircraft were imminent. Through his exceptional alertness, appropriate corrective action, and with extraordinary skill, he was able to recover the aircraft.



Maj Gen
Me

STR

Through a well defined
Strategic Air Command es
rate of 0.6 in 1970. This a
flying 700,000 hours in it
performance of aircrew a
leadership and effective ma



E S AIR FORCE

y Trophies

Chief of Staff Individual Safety Trophy

☆

Col Roy H. Crow

As Director of Safety, Hq 15 Air Force, SAC, Colonel Crow pursued an aggressive safety management program that significantly reduced accident rates. In addition to his other accomplishments, Colonel Crow established the 15th Air Force Deficiency Review Panel, an effective management program which meets quarterly to review action taken at all levels of command.

☆

Maj William M. Thompson

While serving as Safety Officer, Hq ATC, Major Thompson's devotion to duty and superior managerial abilities produced an accident prevention program for Air Training Command that is considered outstanding. Major Thompson also spearheaded numerous projects that decreased the accident potential within the undergraduate pilot training program.

☆

MSgt Darrell E. McNeese

Due to the leadership of MSgt McNeese, the ground safety program of the 381st Strategic Missile Wing, SAC, was greatly improved during 1970. In addition, he established a safety program for another unit that was adopted in all safety functions of the Eighth Air Force.

☆

SSgt William L. Wilt

As Ground Safety Superintendent, 1956th Communications Group, AFCS, Sergeant Wilt demonstrated outstanding devotion to duty and ability to initiate substantial changes in the accident reporting and analyses procedures of AFCS. As a result, substantial reductions were made in command accident rates with corresponding savings of Air Force resources.

D. Foulois
ward

MAND

ent prevention program, the low major aircraft accident rred while the command was operations, a tribute to the sonnel supported by strong



☆

Colombian Trophy

463D TACTICAL AIRLIFT WING

The Colombian Trophy is awarded to the 463rd Tactical Airlift Wing, Clark Air Base, Philippines, for meritorious achievement in flight safety during 1970. The wing attained one of the most outstanding safety records in the Air Force as well as noteworthy achievements in operations and mission accomplishment. During 1970, the wing flew more than 53,000 hours of which more than 34,000 were in a combat environment. The wing overcame the limitations imposed by operating into and out of remote landing strips in Vietnam, under all weather conditions. These outstanding accomplishments were attained through the combined efforts, unsurpassed skill, and dedication of the unit's assigned aircrews and support personnel.



SAFETY

FLIGHT

AAC 21st Composite Wing, Elmendorf AFB AK

ADC 57th Fighter Interceptor Squadron, Keflavik NAS Iceland
49th Fighter Interceptor Squadron, Griffiss AFB NY

AFLC Sacramento Air Materiel Area, McClellan AFB CA

AFSC Directorate of Flight Test, ASD, Wright-Patterson AFB OH

ATC 3575th Pilot Training Squadron, Vance AFB OK
3515th Pilot Training Squadron, Randolph AFB TX
3535th Navigator Training Wing, Mather AFB CA

MAC 40th Aerospace Rescue and Recovery Wing, Ramstein AB, Germany
1st Aerial Cartographic and Geodetic Squadron, Forbes AFB KS
89th Military Airlift Wing, Andrews AFB Wash DC

PACAF 460th Tactical Reconnaissance Wing, Tan Son Nhut AB RVN
1st Special Operations Squadron, Nakhon Phanom Airport, Thailand
21st Tactical Air Support Squadron, Cam Ranh Bay AB RVN
463d Tactical Airlift Wing, Clark AB, Philippines

SAC 307th Strategic Wing, U-Tapao Airfield, Thailand
100th Strategic Reconnaissance Wing, Davis-Monthan AFB AZ
379th Bombardment Wing, Wurtsmith AFB MI

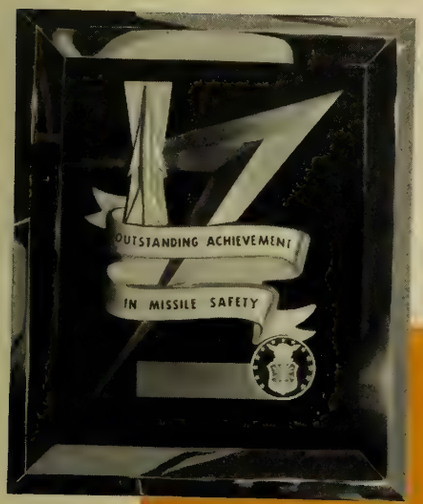
TAC 57th Fighter Weapons Wing, Nellis AFB NV
317th Tactical Airlift Wing, Lockbourne AFB OH
474th Tactical Fighter Wing, Nellis AFB NV

USAFE 525th Tactical Fighter Squadron, Bitburg AB, Germany

AFRES 906th Special Operations Group, Clinton County AFB, OH

ANG 140th Tactical Fighter Group, Buckley ANGB, CO

AWARDS 1970



MISSILE

AAC 21st Avionics Maintenance Squadron, Elmendorf AFB AK

ADC 84th Fighter Interceptor Squadron, Hamilton AFB CA
62d Fighter Interceptor Squadron, K. I. Sawyer AFB MI
46th Air Defense Missile Squadron, McGuire AFB NJ

AFSC Space and Missile Test Center, Vandenberg AFB CA
Air Force Eastern Test Range, Patrick AFB FL

PACAF 432d Tactical Reconnaissance Wing, Udorn RTAFB, Thailand
388th Tactical Fighter Wing, Korat RTAB, Thailand

SAC 320th Bombardment Wing, Mather AFB CA
321st Strategic Missile Wing, Grand Forks AFB ND
381st Strategic Missile Wing, McConnell AFB KS
1st Strategic Aerospace Division, Vandenberg AFB CA

TAC 57th Fighter Weapons Wing, Nellis AFB NV

USAFE 32d Tactical Fighter Squadron, Camp New Amsterdam, The Netherlands

ANG 124th Fighter Group, Gowen ANG Base, ID

MAINTENANCE QC–
THE BAD GUYS???



MSGT DAVID MAC NEVIN, 516 Tactical Airlift Wing, Dyess AFB, Tex.

Aircraft Maintenance Quality Control is known by many names, such as *spies, ratfinks and bad guys*. Does QC, which Air Force Manual 66-1 calls the "eyes and ears of the Chief of Maintenance," deserve these many epithets? Does it really improve efficiency of a maintenance unit? How does QC affect flying safety?

Well, from the viewpoint of one maintenance type who has worked the flightline, in a Field Maintenance Aero Repair Shop, on a Phase Inspection Dock, and as a Quality Control Inspector, the answers depend not so much on the QC section, but on the support the section gets from the Chief of Maintenance, the wing and squadron commanders, and the supervisors and workers actually performing maintenance on Air Force equipment.

People filling the QC slots are supposed to be the most qualified individuals, in their AFSCs, available. In most cases they are, but in the few cases where they aren't, why aren't they? Did the flightline or shop supervisor pass off a "dead-head" to get the man out of his hair? Did the squadron commander approve the man's selection? If so, who is responsible for a poor Quality Control Program?

Take another view. Are QC reports being looked at carefully by all agencies concerned, up to and including the squadron commanders and the Chief of Maintenance? Is positive and lasting corrective action being taken to correct problem areas and deficiencies discovered and reported by QC? If not, how good is the QC program, and once again, who is falling down on the job?

Overheard all too often: "We can't let QC pull an Operation Readiness Inspection on that aircraft today; they might ground it, and we have to fly it tomorrow." If a red cross condition exists, do we *really* want to ask a crew to fly it? Shouldn't it be found and repaired even if it does cause a late takeoff or even a cancellation? Certainly if we think of it, we realize how unrealistic it is even to try to keep QC from getting that ORI.

QC people are human and subject to the same failings and inadequacies as you or I. Certainly there are rotten apples in some barrels, but how did they get there? Someone put them there. For the most part, our QC inspectors are dedicated professionals doing a tedious and often thankless job, trying to make our work areas safer, assuring the flight crews of the best possible aircraft. By being honest and "telling it like it is," they are helping to insure a quality end product. That is what it's all about, isn't it? A quality product? The end product may be AGE, an aircraft, or a component being repaired in the field, but it still boils down to this: We're being paid to do a job; if we do that job to the best of our ability, suddenly the ratfinks (QC) aren't such ratfinks after all. If we all pull together toward the same goal, that of the best quality aircraft, AGE, or other components that we can produce, this Air Force will continue to be the greatest place in the world to work, regardless of where in the world you are. ★



An article titled "Maintenance Technical Orders" appeared in the 12 Feb 71 issue of *TIG Brief*. It read as follows "The Air Force's position on the use of maintenance technical orders was recently reemphasized to the major commands and will be further clarified in a soon-to-be-published revision of TO 00-5-1." (See TO 00-5-1, dated 1 Dec 70, and change one dated 1 April 71.)

"Technical orders must be in the possession of, and used by, the mechanic at the job site whenever procedural-type maintenance is being performed."

The question immediately raised is "How?" How, for instance, would a hydraulic mechanic handle a TO while he is up in a wheel well removing and reinstalling a retracting cylinder? Must he hold the wrench in one hand and the TO in the other? Obviously not.

In simple terms, the USAF policy is this: the mechanic must have the TO, or the abbreviated checklist, *at the job site*. In the case of our hydraulic mechanic, the TO will be at the airplane with him—not back in the shop. If the work is being performed in the shop, the TO will be on the bench next to the job, not in the bookcase across the room. Of course, just having the book with him is not enough. He must refer to that portion pertaining to the job he's doing.

The trouble is, the more often we perform a particular task, the better we do it; and the better we do it, the less we tend to rely on checklist procedures and step-by-step instructions. Our daily lives are filled with hundreds of complex tasks which we accomplish without the help of a tech order—why should the job be different? It's not —we could all use a bit more checklist in our daily lives too. Ever left your lights on and come back to find your battery dead? Has the kid forgotten his lunch money lately? Ever been nearly run down by a conscientious motorist who was trying to fasten his seatbelt as he drove down the street?

We can get away with not using the TO for awhile, perhaps. But sooner or later there'll be a change which isn't obvious; or we'll be distracted in mid-job . . . and we'll stumble.

What will the stumble cost? Time? Effort? Money? Our life? Someone else's life?

Will that B-nut back off and allow fuel to gather in the lower compartment? Will that brake line come loose at a critical moment? Will an aileron bind up the first time the pilot breaks left? All the right answers can be found in the TO. ★

(Failure to use tech data is a frequent discrepancy written up in Unit Effectiveness Inspections.—ed.)



OVER-EAGER BEAVER

In military flying there are times when you just gotta go . . . but this wasn't one of them.

The T-38 student pilot was taking off on a solo mission. After flap retraction, he noted that the aircraft was nose-heavy and that full aft trim would not correct the situation. The elevator trim was operating, but did not have enough nose-up trim authority, and the student had to hold constant back pressure. *The student felt this was not critical enough to warrant aborting, and continued on his transition mission.* After a couple of maneuvers, the student rolled in from 15,000 feet to pick up airspeed for a loop. Approaching 500 knots, he applied back pressure, hesitated a moment, then reapplied back pressure, and the airplane entered a series of violent pitch oscillations. The student released back pressure, but oscillation continued. The general flight path of the aircraft was downward, so the student seized the stick and tried to freeze it slightly aft of neutral. This produced a massive nose-up oscillation which drove the student's head down to his knees. As airspeed decreased, the aircraft became controllable, and recovery to normal flight was made some 3000 feet AGL. (We don't know how low he got during the roller-coaster ride.) The student declared an emergency, performed a controllability check and landed back at home station.

Investigation revealed a broken flap/slab interconnect cable, which did not allow the slab to reposition after flap retraction and accounted for the nose-heavy tendency. Investigation also disclosed minor skin damage from overstress (the G-meter was pegged on both ends of the scale: +10G to −5G).

This was one lucky young fellow, and we'd hope that airing his story would give pause to over-eager beavers everywhere. If it doesn't fly right, stop and get it fixed!

Ops

OPS CH

The C-141 was on the last leg home, one hour o
of its departure base, cruising peacefully at flight lev
330. "George" was doing his usual sterling job, and t
copilot had stepped to the back for a cup of coffe
As the airplane crossed a mandatory reporting poi
the pilot directed "George" into a 30-degree bank
turn to a new heading, and then turned his attenti
to transmitting the position report. "George" chose th
moment to take a dive. By the time the flight engine
noted the unusual attitude and alerted the pilot, t
big bird had smoothly transitioned to steep bank, no
low, descending at about 11,000 fpm and accelerati
through .85 mach. Recovery was uneventful, with al
tude loss of about 6000 feet. A Dash-3 inspection r
vealed no damage to the airplane.

The incident report listed pilot inattenion as a co
tributing cause. Admittedly, the pilot let it get awa
and there's no telling how far things would have go
if the flight engineer hadn't been alert. Still, it was tw
in the morning, and night flight over open water offe
some awfully sketchy outside references. And pilot i
attention didn't have a darned thing to do with t
autopilot malfunction.

What did? Let's see

Two days before, the autopilot had been written
as "erratic in all modes. Frequently bounces the aircra
with abrupt control inputs." Corrective action rea
"Autopilot vertical gyro removed and replaced. O
checked good on ground." It was signed off by
Airman First Class.

opics

D OKAY

One day prior to the incident the autopilot was again
itten up, this time for commanding an abrupt climb.
orrective action, by a Sergeant, read, "Suspect im-
oper switching sequence by operator (!) . . . Ops
eck IAW"

That same day the autopilot was *again* written up,
s time for commanding an abrupt left bank. Cor-
ctive action, by the same Sergeant, read "Could not
plicate malfunction. System ops checked IAW"

Let's take a look at TO 00-20-5, which contains a
te under the paragraph on Corrective Actions: "A
ght crew-reported discrepancy will not be cleared as
nnot duplicate malfunction' until all possible trouble-
ooting actions have been taken. If the specialists or
chanics experience difficulties in duplicating a mal-
ction on the ground, they will request assistance
m higher skill-level personnel. Malfunctions of this
ure should be thoroughly discussed with flight crew
sonnel upon landing or at the debriefing meetings
solate the reported problem."

We frankly doubt that any of the sensible actions
uired by that note were accomplished. We're fairly
tain that the pilot who was suspected of having
improperly sequenced" his autopilot switches would
e had something to say about it during the debrief-
—if there had been one. Apparently, in this case,
re's a maintenance facility that didn't do all it could
support safe mission accomplishment.

NOMEX FLYING SUITS

Accident statistics indicate that FIRE was involved in 65 percent of the survivable, takeoff phase, aircraft mishaps during the past two years. Six individuals lost their lives as they attempted egress from burning aircraft. Nomex flying suits have saved lives and reduced injury during egress from burning aircraft—HOWEVER, some crewmembers are not wearing these suits when they are available. The new AFSC Supplement to AFM 60-16 will make the wearing of Nomex flying suits *mandatory where they are available.* The subject is one of expressed interest on the part of USAF/IG and can be expected to be a special interest item for future inspections. Like seat belts in automobiles, Nomex flying suits are provided to save lives and it is regrettable that their use can only be insured through the use of regulations.

(Air Force Systems Command Safety Management Newsletter)

AIRCRAFT TIRE INFLATION

In the past few weeks one major aircraft accident and several incidents occurred involving both new and rebuilt tires. Under-inflation was evident in most failures. It is imperative that aircraft tires be inflated properly for gross weight of aircraft prior to each flight. If tires are operated on one mission under-inflated, damage will result and the tire can fail on a later mission even though properly inflated. With hot weather approaching, tire problems will be compounded if tires are not inflated to proper pressures before each mission.

(AFSC Safety Management Newsletter)

OPS topics

UNAUTHORIZED EQUIPMENT—COCKPIT

After an F-84 crashed while conducting a simulated attack on a bridge, the primary cause for the accident was assessed as pilot factor because the evidence strongly indicated that he had entered a maneuver from which recovery was impossible. However, the accident investigation team found, in the wreckage, a cigarette lighter that did not belong to the pilot. Although the lighter was apparently not a contributing factor in this accident, such objects complicate the investigation of an accident. This gives us at least two good reasons for cockpit cleanliness:

1. To prevent an accident,

2. To not make an accident investigation more difficult than it is.

Lt Col Leland P. Kriner
Directorate of Aerospace Safety

AW-W-w-w!!

The message traffic the other day contained an interesting but somewhat startling account of a bird strike.

QUOTE: Small bird impacted left lower windscreen in a right climbing turn out of traffic at 2700 feet, 240 KIAS, species unknown. Insufficient remains for disposition. UNQUOTE.

We keep telling those birds not to keep their heads down in VFR weather!

FLIP CHANGES

Departure Notification: Civil airports do not automatically notify FSS of an aircraft's departure time as military fields do. It should be noted that this includes stop-over flight plans and that after each takeoff from a civil field the pilot must contact FSS and pass his actual takeoff time. (FLIP Planning Section II, N&S America, Section II, Par 1, D.).

Canadian Cruising Altitudes: Canada has extended the use of 1000 feet of vertical separation for IFR flights up to FL 290 and redesignated cruising altitudes. This eliminates the possibility of opposite direction traffic being at the same altitude in the area of the boundary between US and Canadian airspace.

BLAME IT ON THE WIND!

After a T-38 out-'n-back, maintenance found a broken nose gear strut door. We imagine they found it rather quickly, because they must have been looking all over the aircraft for the Form 781. It seems that, since the canopies were left closed because of gusty winds at the turn-around base, transient alert stored the forms in the nosegear well. We sort of regret that the forms stayed with the airplane when the gear was lowered because we could have made a funny about a *very* exceptional release. Do you suppose using the checklist for preflight might have prevented the incident?



NUCLEAR SAFETY AID STATION



THE OTHER GUY

On a midwest road the reentry vehicle convoy was proceeding with due caution. As they passed a farmer's field, dense clouds of lime suddenly swirled across the road, markedly reducing visibility. The convoy slowed to 7 mph, but a civilian vehicle approaching did not take proper precautions and a collision occurred. Due to the alertness of the convoy in slowing for an unusual situation, there were no injuries and only minor damage was incurred. We commend those convoy drivers for observing speed consistent with driving conditions, and remind you to watch out for the other guy.

HELP!

AID THE MISSION BY SUPPORTING THE AID PROGRAM

Believe it or not, there are several thousand people in the Air Force who devote all of their efforts to insuring that each piece of equipment provided the user in the field is designed to be easily maintained, efficient, and safe. Also many people devote their efforts to ensuring that technical data and instructions for inspecting, maintaining, and operating the equipment are safe, efficient, and within the capabilities of the individuals who perform these functions.

In spite of all these efforts devoted toward making the individual's job easier and safer, frequently he is provided with deficient equipment and/or procedures. In most cases the burden of bringing these deficiencies to the attention of people who can correct them falls on the guy who has to maintain and operate the equipment. This is a pretty big pill for him to swallow at times, but we have not reached the stage where first production results in perfect equipment and procedures. The best way we know of to correct deficiencies that could affect nuclear safety is to report them in accordance with AFR 127-4. So look around; if you see a deficiency, report it!



GUIDANCE AND CONTROL OUT

Have you ever experienced a power steering or power brake failure on your automobile? If so, you were probably startled and perhaps a little scared. A reentry vehicle tractor in convoy recently lost its power steering due to a loose screw on the pulley. In this instance no problems were encountered in stopping. However, one can imagine the accident potential if it had happened on a dangerous curve or a narrow road. Remind your vehicle maintenance personnel to make a closer check of these items which are essential to safe operation. Don't permit negligence to cause you to lose your guidance and control system.

REX RILEY'S CROSS COUNTRY NOTES



• The two letters from the field reprinted in our March issue generated quite a bit of comment from our readers. All good. A letter from a flight surgeon pointed out the need for recognition of the troops responsible for transient services, especially where they have been identified as performing outstanding work. A feature story in the local weekly concerning a base which is on the "Recommended List" gave a deserved pat on the back. Does your base transient service rate this kind of publicity?

• Rex is turning more attention to VOQ and TAQ. After a recent evaluation of eight bases, we are happy to report that these facilities

were generally good. We hope this is a trend throughout all our bases.

• Release of recent information by DOD indicates that some of our installations will be closing their doors before long. We are printing a letter from one of these that demonstrates an attitude we think is becoming contagious throughout the Air Force.

"Just finished reading your Cross Country Notes in the March issue and I must say that I am ashamed of the treatment some of our flight crews are subjected to on their cross country flights. We here in the Transient Alert section at Perrin Air Force Base feel that they deserve the very best that we can give.

"We are proud that we have been the recipient of the coveted 'Rex Riley' award since January 1954 to the present. Prior to this time we were also proud to meet the Duncan & Heinz preferred list of better bases. From January 1954 to March 1971 we have handled 33,932 transient aircraft and have made many friends.

"Due to our phase out and scheduled closure 30 June 1971, we realize that the March issue is probably the last time Perrin AFB will appear on your honor roll. I would like to make one request if you have the space in your fine magazine. Please let the flight crews know how much we have enjoyed their visits to our base and hope that other transient alert crews take better care of them than the ones mentioned in your March issue.

"A fond farewell to you, Rex, and all our friends throughout the services.

EARL G. EVERHART
Foreman, Transient Alert Section
Perrin AFB, Texas"

My congratulations to Perrin for the fine service provided to all transient aircrews. We never doubted that quick, courteous service was available at your base. Everyone will miss this handy and efficient cross country gas stop. It's obvious, Mr Everhart, that your performance as transient services foreman was no less outstanding than it was during your active duty in the Air Force.

Best of luck to you and your fine group of transient service troops.

Rex



REX RILEY
Transient Services Award

LORING AFB	Limestone, Me.
McCLELLAN AFB	Sacramento, Calif.
MAXWELL AFB	Montgomery, Ala.
HAMILTON AFB	Ignacio, Calif.
SCOTT AFB	Belleville, Ill.
RAMEY AFB	Puerto Rico
McCHORD AFB	Tacoma, Wash.
MYRTLE BEACH AFB	Myrtle Beach, S.C.
EGLIN AFB	Valparaiso, Fla.
FORBES AFB	Topeka, Kans.
MATHER AFB	Sacramento, Calif.
LAJES FIELD	Azores
SHEPPARD AFB	Wichita Falls, Tex.
MARCH AFB	Riverside, Calif.
GRISSOM AFB	Peru, Ind.
PERRIN AFB	Sherman, Tex.
CANNON AFB	Clovis, N.M.
LUKE AFB	Phoenix, Ariz.
RANDOLPH AFB	San Antonio, Tex.
ROBINS AFB	Warner Robins, Ga.
TINKER AFB	Oklahoma City, Okla.
HILL AFB	Ogden, Utah
YOKOTA AB	Japan
SEYMOUR JOHNSON AFB	Goldsboro, N.C.
ENGLAND AFB	Alexandria, La.
MISAWA AB	Japan
KADENA AB	Okinawa
ELMENDORF AFB	Alaska
PETERSON FIELD	Colorado Springs, Colo.
RAMSTEIN AB	Germany
SHAW AFB	Sumter, S.C.
LITTLE ROCK AFB	Jacksonville, Ark.
TORREJON AB	Spain
TYNDALL AFB	Panama City, Fla.
OFFUTT AFB	Omaha, Nebr.
ITAZUKE AB	Japan
McCONNELL AFB	Wichita, Kans.
NORTON AFB	San Bernardino, Calif.
BARKSDALE AFB	Shreveport, La.
CHANUTE AFB	Rantoul, Ill.
KIRTLAND AFB	Albuquerque, N.M.
BUCKLEY ANG BASE	Aurora, Colo.

Tech topics

briefs for maintenance techs

MOVE AND / OR SECURE OR TOW

While a C-135 was taxiing onto a parking spot, its jet blast blew over an MD-3 and caused an MA-1A to roll 20 feet. How did it manage to do something like that? Here's how. The MD-3 and the MA-1A had been pre-positioned near another C-135. The pilot of the taxiing C-135, following the directions of the marshaller, applied additional power to Nr 3 and 4 engines to enable him to make a sharp left turn and maneuver into position. When the additional power was applied it blew over the MD-3 and caused the MA-1A to take off. Simple as that.

When marshalling aircraft, ground personnel must take precautions and either secure or move all equipment that will be affected by the jet blast. If this is not possible, have the engines shut down and tow the aircraft to the spot.

* * *

OFFLOAD ACCIDENT

While a C-130 crew was performing a combat cargo offload, a loadmaster was injured. The sequence of events leading up to the accident was as follows: The C-130 was loaded with five 463L pallets in wide configuration. The number five pallet was offloaded without incident. During preparation for the offload of number four, the loadmaster encountered difficulty in shifting the pallet toward the rear of the aircraft. Unable to move the pallet by himself, the loadmaster asked for help from a cargo handling specialist. As soon as the number four pallet was in position for offload, the loadmaster signaled the flight mechanic to have the pilot move the aircraft forward. As the aircraft moved forward the number three pallet started moving aft. The loadmaster, noting that it was about to hit the cargo handling specialist, leaped forward and knocked him out of the way. His quick action saved the cargo handling specialist, but the pallet hit the loadmaster's foot. Ouch!! Had the loadmaster followed the checklist, the number three pallet would have been locked down and the accident would have been avoided.

* * *

LOOSE PANELS CONTINUED

The T-38 had no indications of a problem in flight; however, on postflight the crew chief discovered the horizontal stabilizer panel in the following condition: the forward one-third was folded back and torn on both sides. Investigation of the aircraft records revealed that, on the day prior to the incident, the aft section had been removed for replacement of the afterburner fuel control. When the panel was replaced only two of the 30 fasteners were properly secured. Maintenance people goofed. Their goof was compounded when the loose panel was not discovered on preflight by the pilot.

* * *

RUN AWAY

An O-2 was scheduled for an engine run in an attempt to duplicate a malfunction reported on the previous flight. According to the writeup, "when engine was fully warmed up it would not reach full RPM."

Two men were assigned to perform the ops check, a runup man to run the engines and a prop man to observe and try to determine the cause of the malfunction. In accomplishing the before starting en-

gines checklist, the parking brake knob was pulled out but the brakes were not pumped. Both engines were started and the front engine was operated at 1800 rpm to provide positive airflow for the rear engine. After the engines had reached normal operating temperature the rear engine was accelerated twice to maximum power for approximately five seconds, then reduced to 1800 rpm. While decelerating the second time the aircraft started moving forward. Power was not reduced to idle until the aircraft had moved approximately 10 feet. A 45 degree right turn was made to avoid a row of parked aircraft 75 feet ahead. However, the aircraft traveled another 65 feet before colliding with another O-2. During the time the aircraft was moving, the operator was trying to apply the brakes. The mixture levers were finally pulled to cutoff just prior to making contact with the other bird.

Cause of this mishap was the operator, but how about supervision? He was not checked out in accordance with AFR 60-11. The chocks were not properly positioned, the brakes were not properly set. In short, this operator should not have been allowed inside the cockpit, especially with the engine running.

* * *

NEGLECT

The NCO supervisor instructed the airman to disconnect the comfort pallet of a C-141 to prepare it for removal. The airman proceeded to disconnect the vent line, the waste drain and the tiedown chains. At this time the comfort pallet was offloaded and ten pallets of cargo were loaded. As the load crew was installing the barrier net, sparks were observed coming from two broken wires which were shorted against the cargo rails on the right side of the aircraft. Power was removed from the wires and the necessary repairs made.

We're sure you've guessed how the wires got broken: the sergeant in charge had given the airman insufficient instructions on how to do the job and the airman neglected to disconnect the electric leads to the comfort pallet. The warning note in TO 1C-141A-2-2, "Pull comfort pallet circuit breakers" was not complied with either. Thus, the airman failed to both unplug the pallet and pull the CBs.

Had these two broken wires gone undetected, they may have led to a major inflight emergency. Just one more example of why we *must* follow the TO.

* * *

POOR WORK AND QC, TOO

At FL 390 the T-38's right engine fire light came on. The pilot retarded the throttle to idle and the light went out; however, approximately two minutes later, the light came back on. The engine was then shut down and a single engine landing made without further difficulty.

The air inlet duct (PN 3-51016-1) had been bent during previous maintenance and did not fit properly with the aircraft inlet. Ram air bypassing the engine was sufficient to cause the fire light to illuminate. This incident highlights the need for more careful work and better inspection.

* * *

HE LOST HIS MITTEN

After engine start on an F-5, a maintenance man disconnected the power unit and went to the front of the aircraft, where he noticed that the cockpit steps were still extended. He signaled the pilot and was in the process of closing the steps when a leather glove was sucked off his right hand and into the left engine intake. After engine shutdown the left engine inspection door was opened and most of the glove was found lodged against the front stators. A portion of the glove and the wool liner went through the engine, necessitating an engine change.

* * *

F-100 RIGHT TURN ONLY

Preflight, start, taxi, takeoff, climb and cruise to the training area were all normal. Then the pilot discovered that he could move the left rudder pedal only one inch. The mission was terminated, an emergency declared and a straight in approach and landing made without further difficulty. The problem was that the right hand center pedestal door (PN 223-53198-51, TO 1F-100D(1)-4) was incorrectly installed with a loose mounting screw. The incorrect mounting caused the right rudder pedal to catch on the door when the pilot applied left rudder.

* * *

MAINTENANCE FACTOR

While practicing GCA low approaches an F-4 crew heard and felt an explosion and the IP saw a flash of fire on the left side. The left engine RPM decreased to 65 percent. The aircraft commander selected full afterburner on the right engine, retarded the left engine to idle, and selected half flaps. All instruments on the left engine were normal at idle. Mobile control informed the crew that sparks were coming from the left auxiliary air door and the left tailpipe, but there

Tech
topics

was no evidence of fire. An emergency was declared and a single engine landing was accomplished without further incident.

Maintenance bought this one. Two forward mount bolts of the upper engine mount sheared due to stress caused by damage received during installation. One bolt was ingested into the engine and one was found in the engine bay.

* * *

CAUTION! DANGEROUS TURN

After completing the green run, the maintenance crew of an F-4 was leak checking the refrigeration package and engine boundary layer control ducts. With both engines running at idle, two men were stationed under the aircraft for leak checks, one at door 16 and one at door 6R. The mechanic by door 6R wanted the left engine accelerated. In the meantime the man in the cockpit had noted vibration in the right engine. When he received a signal to accelerate, he thought it was for the right engine and proceeded to run the engine up to military power to check for engine roughness.

The mechanic under the right side of the aircraft, startled by the right engine being run up, turned toward the engine intake and was sucked up against the protective guard. A flashlight was drawn from his hand and ingested into the engine. The man was taken to the hospital where it was determined he had no serious physical injury. The engine compressor didn't get off so lightly. It received extensive damage from the ingested flashlight.

Lack of adequate communication caused this incident that could well have resulted in a fatality. Supervisors, take a look at the training program for personnel who participate in operational checks with the engine running. Be sure that every man is aware of the dangers involved and correct procedures to use.

* * *

SAFETY WIRE?

As the pilot rotated the aircraft for takeoff, he felt a binding in the stick. Too late to abort takeoff, the pilot gingerly held what he had and, once clear of the ground, cycled the stick back and forth a few times until the binding disappeared. After landing, investigation disclosed a well-battered, bent-up, half-used roll of safety wire (!) lodged in the stick well area. Records showed no maintenance in this area during the previous ten months, so the culprit goes undetected. We just hope he took better care of his next roll of safety wire.

* * *

GO-I-TIS

Sometimes it's best to shut down and start over, even if it means getting off late. To fully understand that statement read the following incident.

While attempting to strap into the back seat of an F-4, the GIB discovered that the inertial reel would not unlock. He accepted the condition based on the fact that he could still sit erect in the seat. However, after engine start, he could not find the garter clamp on the right upper leg restraint so he unstrapped and climbed out to allow the crew chief to look for the missing clamp. Because of the late arrival of the starting unit, the aircraft commander did not shut down the engine and advised the crew chief to be careful of the head set extension cord. After the garter clamp was found, the GIB strapped back in and found the inertia reel had withdrawn further so he had to "scoot" down considerably to fasten the shoulder harness. The crew chief again attempted to help the man release the harness and, in an attempt to get more slack in the headset cord, gave it a tug and flip. The connection came loose and the cord moved in the direction of the intake; three to five feet of the cord was sucked into the engine.

Did the pilot have go-i-tis? If not, why didn't they shut down and investigate the inertia reel problem?

* * *

FALSE ALARM

During FCF at FL 430, .95 mach, full afterburner, the F-4's right engine overheat light came on. Throttle was retarded below 90 percent and the light went out. All other engine instruments were normal and the return to base was accomplished without incident.

Investigation revealed one broken and several bent pins on the cannon plug to the fire warning and overheat control panel. You spark chasers must exercise caution and be sure that all electrical connections are made properly.

Toots

is interested in your problems. She spends her time researching questions about Tech Orders and directives. Write her c/o Editor (IGDSEA), Dep IG for Insp & Safety, Norton AFB CA 92409

Dear Toots

TO 00-25-4 exempts AFSC aircraft from scheduled IRAN. We have an aircraft presently over two years overdue IRAN. How long can this aircraft be flown and still be considered safe without going to IRAN?

Concerned
Kirtland AFB, New Mexico

Dear Concerned

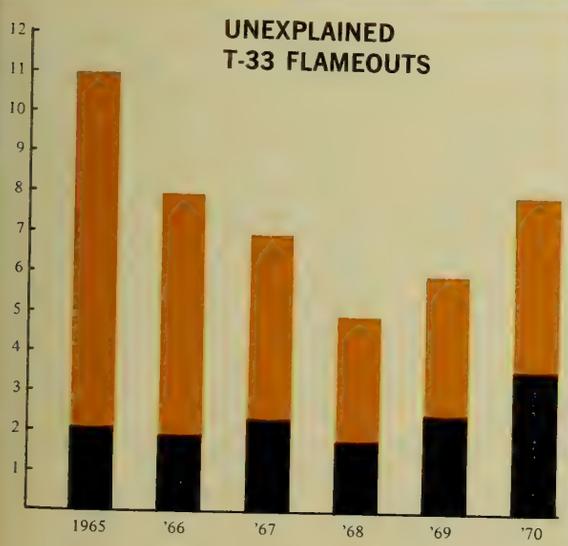
I passed your question on to the OPR at AFSC Headquarters. According to them, in consideration of AFSC's mission, they have not established an IRAN requirement for AFSC aircraft. TO 00-25-4 thus excludes them. However, if AFSC feels that the condition of an individual aircraft warrants this inspection and repair, AFSC Headquarters can request that the aircraft be inspected. Such a request should be submitted for the fiscal year in which the IRAN will be required.

Toots

* * *

ERRATA

The legend on the chart, page 19, April issue was somewhat garbled. For you folks concerned with the T-33, we have redrawn the chart and corrected the legend. Sorry about that.—ED.



Color bars indicate number of unexplained flameouts. Black portion indicates rate per 100,000 flying hours.



mail call



MISSED APPROACH POINT

Reference the IPIS Approach in the February issue; the missed approach point (MAP) for a localizer approach would not normally be at the end of the runway as stated. AFM 55-9, para 957, states, "The missed approach point is on the final approach course not farther from the final approach fix than the runway threshold." Thus, while a pilot could be required to execute a missed approach at the end of the runway due to lapsed time from the FAF, the middle marker would normally be the MAP since it is an ancillary component of the ILS (LOC). Also, since the missed approach slope begins at the MAP, elapsed time should be measured from the OM to the MM and a missed approach commenced at that time in the event the MM is off the air. Incidentally, I doubt the existence of either an ILS or LOC approach that doesn't utilize a MM for MAP.

Not meaning to nit-pick, I think the IPIS Approach is a fine section in a fine magazine that should be read by all pilots.

Maj Clyde W. Picht
1904 Communications Sq
Malmstrom AFB, Montana

We went back to the experts for an answer to your letter. Following is their reply:

You can determine where the missed approach point (MAP) for a localizer (LOC) approach is by comparing the distance on the timing block to the distance shown in the profile view. In our example, the timing is based on 4.8 NM. The profile view shows 4.1 NM from the OM to the MM and 0.7 NM from the MM to the runway threshold for a total of 4.8 NM. Virtually all localizer approaches are this way, yours at Malmstrom being exceptions. The approach designer considers two MAPs when the ILS and LOC missed approach points do not coincide.

The missed approach point for an ILS is the intersection of the glide slope and the decision height. If the approach has a middle marker, it will normally be fairly close to this point. At Norton AFB, the MM is 2402 feet short of the MAP. If you started your missed approach at the MM, you would be 126 feet above decision height. At Reese AFB the MM is 1738 feet beyond the MM. Reliance on the MM would place you 76 feet below DH when you started your missed approach.

A quick review of US approaches shows at least five different ILS installations where there is no middle marker. All five provide decision heights of 200 feet above touch down zone. There are many others with no MM which would have 250 foot decision heights. Approval of an approach without a MM does require a waiver from Headquarters, USAF.

In summary, for an ILS approach begin your missed approach when at DH. For a LOC approach begin your missed approach as indicated on the approach plate (normally determined by timing from the outer marker).

* * *

FUEL SYSTEMS REPAIRMAN

While reviewing your excellent articles in the March issue, I came to an article in the Tech Topics column, "Human FOD," and was rather taken aback when you referred to a Fuel Systems Repairman as a Fuel Cell Maintenance Man.

We, the Fuel Systems Repairmen here at U-Tapao, highly resent being referred to as Fuel Cell Repairmen since our AFSC (424XO) is highly complex, and we do much more than maintain fuel cells. The term "fuel cell," is described in TO 1-1-3, page 2-1, para 2-2, as "Removable fuel container constructed of fabric nylon and gum stock." Since we have a much larger area of responsibility than rubber tanks, we would appreciate being referred to as Fuel Systems Repairmen and not the antiquated term of Fuel Cell Repairmen.

Sgt Kenneth L. Williams
307 FMS
U-Tapao Afld, Thailand

Sorry. We'll try to do better next Time.

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UNITED STATES AIR FORCE

WELL DONE AWARD

Presented for outstanding airmanship and professional performance during a hazardous situation and for a significant contribution to the United States Air Force Accident Prevention Program.

LT COL Leroy L. McCampbell

LT COL Edwin L. Proctor





1st Composite Wing, Andrews AFB, Washington, D.C.

On 11 September 1970 Lt Col McCampbell was assigned a Functional Check Flight upgrading sortie, with Lt Col Edwin L. Proctor, the Instructor Pilot, occupying the rear seat of a T-33A. After 30 minutes of flight, one negative "G" was pulled for three to four seconds to check the fuel vent warning system; no abnormal conditions were noted. Approximately five minutes after the negative G maneuver, right aileron was applied to roll level from a left turn. The pilot stated it felt as though the stick was bumping against a solid object.

The pilots analyzed their situation and found that the aircraft could be controlled in the landing configuration with only rudder and left aileron. They decided to terminate the mission. Since they would be making a downwind landing, the pilots requested that the departure end barrier be removed and that crash equipment be summoned. Then, making a wide left pattern and approaching downwind so that a left crosswind would be affecting the path of their flight, the pilots flew their aircraft to an uneventful full-stop landing.

Investigation disclosed that a bucking bar, used to replace rivets in the static ground receptacle beneath the right wing, had been left within the wing and had wedged itself against the aileron control cables.

The professional competence demonstrated by these pilots, resulted in the saving of a valuable aircraft. WELL DONE! ★

don't get carried away



BY CARELESSNESS



YOU COULD BE DEAD WRONG!

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Aerospace SAFETY

FOR AIRCREWS, MAINTENANCE & SUPPORT TECHNICIANS

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JULY 1971 AFRP 127-2 VOLUME 27 NUMBER 7

don't bust the trust

VERNET V. POUPITCH
Directorate of Aerospace Safety

Would you "bust" the trust that flight crews have in you? This article is prompted by the numerous flight control system disconnects on record and accidents that have resulted therefrom. The primary cause of those accidents has nearly always been the same—Maintenance personnel failed to properly connect the system and Inspection personnel failed to assure that the work was done properly.

When you in Maintenance sign off the Form 781, the pilot depends on your word and signature that the system is safe and operational. He seldom challenges you (although he can) to say, "Open that panel and I will check it out for myself."

How then does a breach occur? Let me paint a portrait of a typical aircraft accident involving a flight control disconnect:

The fighter was departing on a day mission. After engine start the crew chief extended one finger indicating readiness for the AFCS and PCS checks. The pilot ignored this PCS/AFCS check and gave the signal for the ground crew to remove the wheel chocks. Neither the crew chief nor the last chance inspector saw the pilot perform a functional check of the stabilator (the crew chief did notice an ailerons check).

The pilot appeared to be in a hurry to make his takeoff, which had been delayed due to weather. Nose wheel liftoff occurred at the proper location on the runway, but instead of maintaining normal takeoff attitude, the nose of the aircraft continued to rotate rapidly and smoothly. The aircraft left the runway in an extremely nose high attitude which continued to increase to about 70 to 80 degrees. At an altitude of about 100 feet the canopy left and several seconds later the radar intercept officer ejected. The pilot went about one second later. Too low . . . both fatal!

The aircraft crashed on the runway.

The *primary cause* was maintenance error in that the job inspector failed to detect the incomplete installation of . . .

Contributing causes:

1. The job supervisor did not observe or discover the omission of the cotter pin installation in the castellated nuts on the top and the bottom mounting bolts.

2. The person performing the work omitted the cotter pin installation on the top and bottom mounting bolts.

3. The flight line chief allowed the installation of an access panel Nr _____ *without assuring* job completion to include inspection of the work.

Possible contributing causes:

1. The pilot, in hurrying to make a scheduled takeoff time, did not perform a complete flight control system check, or having made the check and not receiving normal response from the systems involved, elected to accept aircraft for flight.

2. The breakdown in communication between the auto pilot shop, maintenance control, and the flight line chief allowed premature installation of the access panel.

3. Shortage of maintenance personnel induced increased overtime and a fatigue factor . . . etc., etc.

4. Overall maintenance supervision.

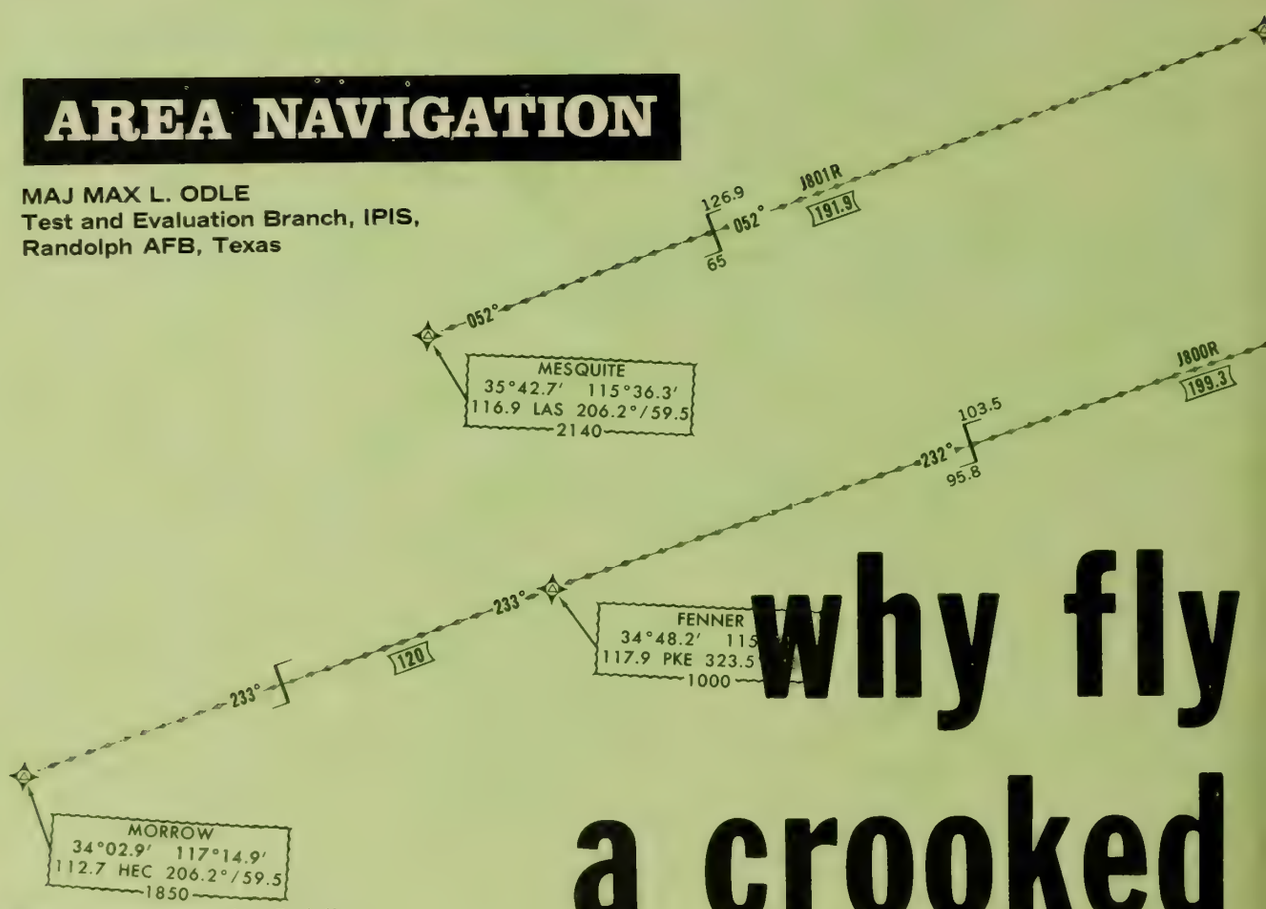
So the moral of this story is that the job must be right and let no Ops pressure force you to manslaughter!

When you sign off a performed task, you are betting that your valuable technical competence and reputation will assure the safety of your flight crews and multi-million dollar aircraft. Also, that with your intimate knowledge of the system, you have not only verified the proper performance of the particular task assigned but also verified the integrity of the system immediately upstream and downstream. Your signature is your oath—don't "bust" the trust! ★



AREA NAVIGATION

MAJ MAX L. ODLE
Test and Evaluation Branch, IPIS,
Randolph AFB, Texas

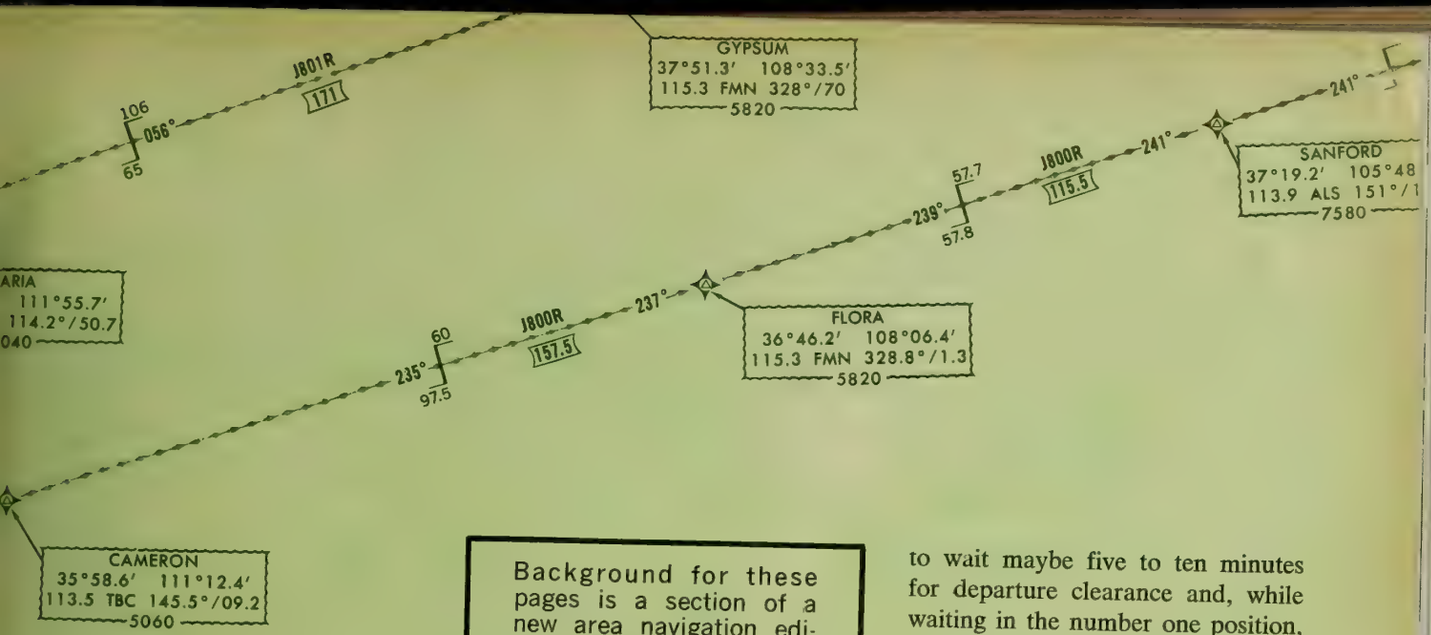


why fly a crooked path?

Many years ago the fledgling airlines and the Air Mail Service generated the first airway navigation system, a string of bonfires on hilltops. This primitive system was soon replaced by light beacons that stretched from one airport to the next. Laid out in nice straight lines, the beacons were relatively simple and easy to fly—if you could see them. But new generation aircraft came with longer ranges and we no longer wanted to go just down the road to the next city in VFR conditions. We needed to go across the country in any kind of weather. The nice simple straight lines of yesteryear became crooked paths as the airways wandered across the countryside from one airport to the next. Today we overfly these fields and the reason for crooked paths no longer exists.

Of course, we're all familiar with the VOR/DME/TACAN airways system that evolved from those light beacons. We're also very familiar with the many problems associated with the system: delayed departures; holding stacks for arrivals; more and more near misses, or worse yet, mid-air collisions because of enroute, arriving and departing aircraft all being crammed into the same airspace over a single navigation fix.

So what's new? *Area navigation* is the new system and it's called "RNAV." Maybe you've already seen the All Commands message concerning RNAV requirements or the Federal Aviation Administration announcement about the implementation of four transcontinental area navigation routes stretching from New York to Los Angeles and San Francisco. These routes became operational in April and the addition



Background for these pages is a section of a new area navigation edition of enroute high altitude chart. Chart is printed in green ink and RNAV routes are depicted in black. Charts are available for review — see Special Notices Section of Enroute IFR Supplement.

of many more RNAV routes is expected to be announced soon.

Still don't understand? Well, don't feel like the "Lone Ranger," because most folks in the airplane driving business don't either. It all started back in August 1969 when the FAA published Advisory Circular 90-45, Approval of Area Navigation Systems for Use in the US National Airspace System. AC 90-45 provided the guidelines for implementation of area navigation within the National Airspace System. In actuality RNAV is not new. When the present VOR/DME/TACAN airway system was designed, RNAV was considered as a possible follow-on navigation system.

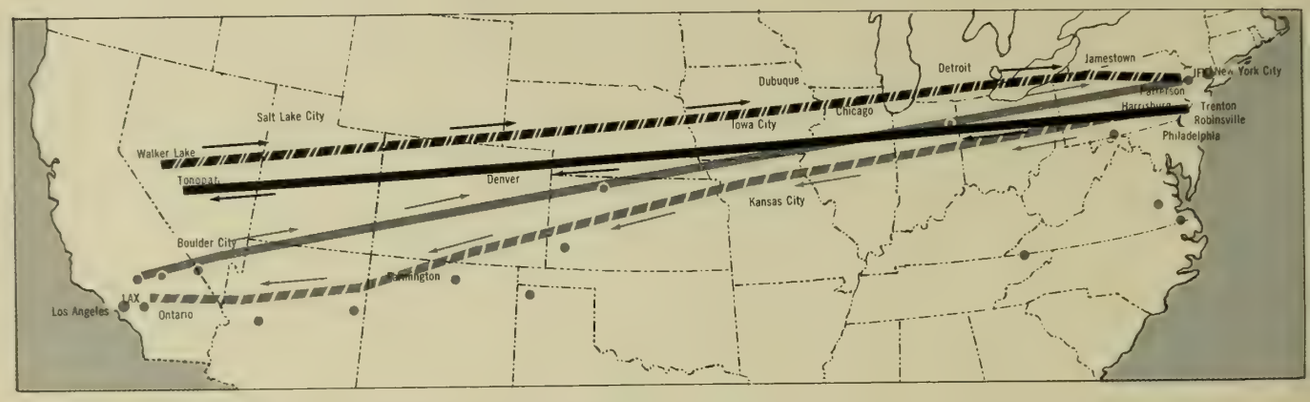
RNAV is nothing more than *a system that can use the present ground referenced navigation system and electronically fix a way point, or phantom station, at any desired point within the service volume area of the station.* You are then able to drive to that point just as if it were the real navigation fix. RNAV can also be flown with certain self-contained navigation systems, provided they have the required accuracies. With the proper control/display equipment in the cockpit, the bearing pointer points at the way point and you receive course guidance on any course you select to that point.

What good is all of this? With RNAV you have the capability to go direct (or almost so) from your departure point to destination and bypass the congested areas. The four new transcontinental routes are basically great circle routes and, therefore, the shortest distance between the East and West Coasts. So what's the difference between an RNAV route and the basic airway structure we have right now?

Besides being shorter than the present airway structure, RNAV has the potential to be a more precise navigation system. Thus, protected airspace for each aircraft can be reduced in size and the volume of traffic increased. With the high cost of flying time, even a small percentage reduction in operating time between two points can mean big dollar savings. Consider also that most air traffic volume forecasts predict three times as much IFR traffic in 1980 as there is today; hence the need for more usable airspace becomes readily apparent.

Let's take a look at departures and arrivals. When did you last depart a high density area and have to wait maybe five to ten minutes for departure clearance and, while waiting in the number one position, you were burning up your valuable JP-4? RNAV should help solve this problem because it permits multiple departure and arrival paths designated by pre-selected way points. "So what? I can always get a radar vectored departure and be on my way." Yes, but that departure controller can only *vector* six to eight aircraft safely. He can *monitor* the departures of several more. With reliable and precise navigation displays in the cockpit, the radar controller can resume his role of monitor rather than navigator. His workload is then reduced and he can handle the emergency or unusual situations that come up, much more easily and with a lot less sweat.

Basically the same procedures apply to arrivals. RNAV gives you the opportunity to choose from several approach way points and paths instead of just one VOR/DME or TACAN initial approach fix. An added safety feature of RNAV is that it virtually eliminates the need to fly circling approaches. A way point can be established on the approach end of almost any landing runway and a straight-in final approach flown to that point. The system also provides the capability for flying non-precision approaches to airfields or areas that do not have a landing navigation aid of their own. In this case, the field must be within the service volume area of the navigation aid and the line-of-sight signal not blocked by



J800R J801R J802R J803R

Area navigation routes begin and end at a VORTAC near (but not on) the terminal airport. With a few exceptions the routes are virtually straight lines, permitting the most direct flight possible.

obstructions.

With new approach computers just over the horizon, you will soon be given an approach time over the runway threshold which you will be able to meet within approximately ± 5 seconds. The arrival controller will assign you an RNAV arrival path based upon your present position, approach speed, vertical descent capability and other traffic approaching the same field. You will proceed along the assigned approach path from one point to the next without delays or vectors from the controller.

In fact, it will be just like an ILS from your cruising altitude to touchdown because RNAV will have three-dimensional guidance. In other words, you will have positive vertical flight path displays that will give you precise vertical guidance just like the glide path indicator and pitch steering bar guidance on flight director system ILSs.

Great! Sounds super! Well, not yet, because not all of us have the capability to fly this new stuff. A quick look at the inventory shows approximately 5000 Air Force aircraft that may have a "limited" capability to fly the RNAV way. These aircraft would include those that have inertial navigation systems, inertial with updating capability, Doppler radar, and LORAN systems.

Even if you have these systems, you still may not be able to fly RNAV because your system may not have the accuracies needed to fly within the RNAV structure. A recent ALMAJCOM message requested the Major Commands to determine their RNAV capabilities and establish criteria for using present equipment in the RNAV route structure. This could mean that your inertial system would be satisfactory if you could get a positive update every 30 minutes or one hour. It all depends on your system and the command's decision.

So you have a system and your command says, "Go to it." How do you file it? The best way is to use FLIP Planning Document II and enroute charts as you fill out your 175. The transponder/Navigation Aids codes are listed in FLIP II and the routes are depicted just like standard airways. The IFR Enroute Supplement is also carrying RNAV information in the Special Notices Section.

Will it work? You bet! But it will take some time and I'm certain a few trials and tribulations. Right now, even the Air Route Traffic Control Center controllers aren't certain what area navigation is and how it will be used. Talk to the controllers in one center sector and tell them you have RNAV capability and they'll clear you any way you want to go. But, on the handoff to the next sector, they may put you back on the standard VOR/DME/TACAN airways system. It will take some time to get it going, but more and more aircraft are getting an RNAV capability and will be able to take advantage of the RNAV system.

The FAA has already stated that it intends to give preferential treatment to those aircraft with an RNAV capability. The airlines have already tested several different RNAV systems and selected systems are in use today in the Northeast Corridor and other areas. ★

THE I.P.I.S. APPROACH

By the USAF Instrument Pilot Instructor School, (ATC) Randolph AFB, Texas

VISIBILITY MINIMUMS

Q After I have started my approach, the visibility is reported as less than that required for the approach. May I continue the approach, and, if I see the runway, land?

A First, continue to fly the published approach until you obtain a new or amended clearance. Your MAJCOM supplement to AFM 60-16 will indicate whether or not you may continue to the missed approach point. If you are permitted to continue the approach, you may land providing the conditions established in para 8-15b of AFM 60-16 are met. These conditions are:

"1. The aircraft is in a position from which a normal approach to the runway of intended landing can be made; and

"2. The approach threshold of the runway, or approach lights or other markings identifiable with the approach end of that runway, are clearly visible to the pilot."

If these conditions are not met, you must execute the missed approach.

CLEARANCES

Q When I receive the abbreviated clearance, "Cleared as filed," must I also receive an altitude?

A Yes. The controller is required by para 951, FAA Handbook 7110.8b, to issue an altitude as part of the abbreviated clearance. Do not accept an abbreviated clearance without an altitude assignment.

ILS

Q To what distance may I use ILS localizer and glide slope information?

A The localizer signal is usable to at least 18 miles within the sector 10 degrees either side of the centerline. If use of the localizer is required at a greater distance, it is flight checked at the required distance and altitude. The glide path signal is usable to at least 10 miles. *NOTE: These are flight check requirements established by AFM 55-8, Flight Inspection Manual, and represent changes from previous requirements of 25 miles for the localizer and 15 miles for the glide path.*

KEEP 'EM HIGH

FAA Order 7110.22 has changed considerably the manner in which IFR turbojet aircraft are handled during arrival and departure. The purpose of this order is to segregate IFR turbojet aircraft from other controlled and uncontrolled traffic. Accordingly, pilots can expect:

(1) Entry to the terminal area (normally 30 miles from the airport) at or above 10,000 feet MSL.

(2) A reduction from cruise speed to 250 knots at least ten miles from the outer fix (a radar fix in the terminal area).

(3) A descent from 20,000 feet MSL or higher at the outer fix not in excess of TERPs criteria (800 to 1000 feet per mile descent gradient).

(4) Arrival delays to be absorbed at the outer fix at or above 10,000 feet MSL in lieu of delaying vectors at low altitudes.

(5) Unrestricted climbs where possible during departure. If an altitude restriction is necessary, altitude assignments below 5000 feet AGL will be avoided.

POINT TO PONDER

Have you flown into Andrews AFB recently? How about Chicago or Atlanta? If so, you should already be familiar with Terminal Control Area (TCA) procedures. If you are not, check FLIP Section II, *Special Notices and Procedures.* The advantages of filing and flying IFR in these areas should be obvious. Also note that AFM 60-16 establishes a 200 knot indicated airspeed restriction in the airspace beneath the lateral limits of any Terminal Control Area.

NOTE

The March '71 Approach article stated that no Air Force aircraft has been certified by the FAA for area navigation. A recent message from Hq USAF gives the major commands authority to determine which of their assigned aircraft meet the criteria established in FAA Advisory Circular 90-45, "Approval of Area Navigation Systems for Use in the U. S. National Airspace System." No FAA certification will be necessary to authorize Air Force aircraft to use RNAV routes and procedures. (See article, page 2, for more on RNAV.) ★

EDITOR'S NOTE: The author, who recently retired from the Air Force Reserve, is an experienced "desert rat" who became interested in desert survival while assigned as a flight test engineer in the B-58 and F-111 programs at Edwards AFB. He has studied the problems of surviving in the desert from many angles, including the first-hand approach. An avid supporter of Air Force aircrews, he frequently shares his experience and knowledge through articles in Air Force publications.



COMPOUND FRACTURE

A downed airman can survive—even with a broken foot, a broken back, a near blind companion, on a 120° day in Death Valley, when no one is looking for him and equipped with only minimum gear. This I proved.

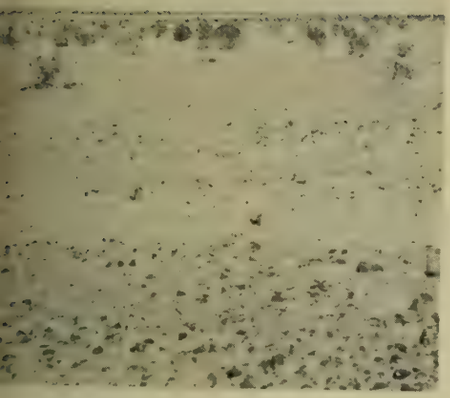
After reviewing the classroom theories of survival, and equipped with a theoretically complete survival kit, I set out to prove that a bailout into the isolated wasteland of Death Valley could be a pleasant camping experience. The first thing I learned was that a planned or simulated emergency could quickly develop into a very *real* and *deadly serious* emergency of the first order.

The survival kit I carried was packed in a 7¼" x 4" x 1½" aluminum box. When filled, it weighed two pounds. Inside the magic box was a .22 caliber pistol, a flare gun, a hunting knife, 25 rounds of .22 ball ammo, 25 rounds of .22 bird shot ammo, 6 flares, a mini signal mirror, 4 packs of beef jerky, 2 bars of high protein candy, a chocolate bar, paper sunglasses, pain pills, antiseptic ointment, sunburn cream, matches, fire starter, snake bite kit, water purifier, water bag, antibiotic ointment, boric acid, chapstick, gauze pads, band-aids, bouillon cubes and a small roll of thin sheet plastic. With that planning, which proved to be an unusual bit of common sense, I carried a two-quart canteen of fresh water. A companion who went along to photograph this great demonstration of man's conquest of the elements was equipped with the same survival gear and another two quarts of water.

The plan was to bail out of an aircraft approximately ten miles north of the northern national park boundary of Death Valley and then to walk the 50 miles to Stove Pipe Wells, using only the survival kit and that which the land provided. A target time of three days was allowed for the walk. The three days was not a positive figure for I planned to go to the surrounding mountain range if things got too tough in the desert.

A band of accomplices was rounded up and a detailed plan for the exercise was made. The photographer and I would bail out over the prescribed landing area at 9 a.m. on a hot August morning. A jeep would be in place near our landing area and would come to our aid if we encountered serious trouble after landing. The jump aircraft would fly over us for a final check of our situation and if all was well, both the jeep and the aircraft would leave us to our own devices. Three days later they would meet us at the wet bar at Stove Pipe Wells for a recovery celebration.

On the day of the jump all went as planned with a single exception—I made an extremely bad landing. Normally, my biggest problem with parachuting is that it takes so long for a 28-foot canopy to get my 125-pound frame to the ground that I suffer from hunger pains. This jump went that same way but I became fascinated with the magnificent view of the valley and drifted about 50 yards from the intended landing



GROVER C. TATE
Palmdale, Calif.

spot. The 50 yards made the difference between landing on level terrain or on big, jagged rocks, so I slipped the chute violently to miss the rocks.

The valley floor slopes from below sea level at the South end to plus 3000 feet at the point we had chosen for landing. The parachute descent rate was pretty rapid at the 3000 foot level and slipping the chute accelerated the rate. With all of these good things going for me, I arrived at touchdown with a chute about three-fourths inflated, a descent rate higher than any I had ever experienced, much rougher terrain than anticipated, and ill prepared for contact. I should say, *impact point* instead of touchdown point, because that is exactly what I did—impact. Rather than try for a picture-book landing, I did a survival roll as I hit the ground. The impact was such as one might experience when jumping from the barn roof and knocking his breath out. I knew that I had hit hard, but had no idea that I was hurt, so I field packed my chute, walked to where my jump companion landed, helped him with his chute, signaled the jeep crew that we were OK, and sat down to make plans for the desert trek. The jump aircraft flew over us and we waved to them that all was OK. Both jeep and aircraft departed to let the world know that we were off on the great adventure.

The day was already warm, 105° at 9:30 a.m., so we decided to head toward the Last Chance mountain range to the West and to make a camp in the foothills. We would construct a tent from the parachute canopies, make lunch, and try to sleep throughout the hottest part of the day. Each of us had a parachute canopy, canteen filled with water, and survival kit. Before starting for the mountains, we put on the paper sunglasses that were in the kits, coated our hands and faces with sunburn ointment, put chapstick on our lips and eyelids, and made Arabic type headpieces from parachute nylon. All seemed serene and as planned except that I had a faint tingle of pain in my right foot and a general feeling of being all shook up physically.

After a mile or so of walking, my right foot really started to hurt, so we stopped to take a look at it. The foot was swollen so badly that it was necessary to cut the boot off. The swelling increased after the boot was removed and the normal fish belly white color changed to black and blue. Rather than sweat this obviously revolting development, I believed that it would lend more reality to the exercise. We wrapped the foot in parachute nylon and made our way to a damp alkali puddle that we had previously spotted from the air. Using the damp mud for plaster, I cast the damaged foot and rewrapped with nylon. When I started to get up to continue the walk, a severe pain in my back erupted, taking away both breath and voice. The pain would subside and recur with alarming frequency. Regardless of body position there seemed to be no way to relieve the pain. Lying flat on my back seemed to minimize the pain and any motion antagonized it. With the foot and back aggravations we now had a real survival problem.

Time wasn't improving our situation so we made a command decision—I would stay where I was and my companion would go for help. With this plan another problem reared its ugly head. My companion was from New York City and knew very little about the desert. He had ten percent vision in one eye and forty percent in the other—when wearing corrective glasses. He had lost his glasses during bailout and without them was nearly blind. So, with our jeep and airplane crews thinking we were okay, there we were under a 120° sun, 23 miles from any inhabited area; one clown with a busted foot and a back that was highly suspect of being broken and a near-blind city-oriented lad as the only immediate link with salvation.

We cut strips from the parachute canopy and, using rocks for weights, outlined a distress signal on the desert floor. We hung part of a canopy over a greasewood bush as a makeshift shelter for me, cut strips from the canopy to use for trail blazing, and created some new ground rules for our survival.

My companion would walk to a road intersection at Grapevine, marking his progress with strips of nylon from the chute canopy. He would walk no more than two miles per hour, would rest at least once every hour, would drink as much water as he needed, and in no way would he compromise his safety. If he had not found help by dusk, he would make camp for the night and start out again the next morning. I would remain at our desert *casa* and would likewise do nothing to compromise my safety.

After my anticipated savior left, I took each of the items from the survival kit and tried to think of alternate uses for each piece of the equipment. I took a pain pill,



SURVIVAL KIT USED

planned a dinner menu, and practiced with the signal mirror. The mud cast on my foot had crumbled so I removed the nylon wrapping. A few minutes after the foot was exposed, large ants started crawling over it, so I coated it with antiseptic cream which alienated the ants completely. Next I cocked the flare gun so that it would be immediately available if someone or something came into view. I loaded the .22 with birdshot as a reception for any unfriendly snakes that might be sightseeing during the cool of the evening. Cocking the flare gun was a real challenge as my back protested in severe pain at any muscular demands. Like the good guys of the old West who bit on a bullet, I bit on a folded match box while I cocked the gun—perhaps a wad of parachute nylon would have been better biting material, but I didn't think of it at the moment.

For lunch I tried a chocolate bar but found it too dry to eat unless washed down with lots of water. Bouillon cubes I found distasteful and potent without water. The beef jerky was the best thing on the lunch menu, so I had a bit of that, a cup of water, and a portion of a jelly bar. For dinner I planned to heat water, make bouillon, melt some chocolate in water and have beef jerky for an appetizer. With the food and water at hand, I figured to live comfortably—albeit monotonously—for at least three days.

To stay occupied, I tried to name all of the heavyweight champions of the world in their order of reign, recited the incantations of the Prophet, imagined realistic shapes to the few clouds in the sky, discussed the state of the nation with Mr Nixon, thought of pleasures past and of those anticipated, made verbal truces with desert critters seen and unseen, looked for possible gold sources in the mountains beyond and wondered how our ancestors ever survived in this vast expanse of nothingness. Purposely, I avoided self recrimination.

Birds, lizards, ants and unidentified insects came by to inspect me and we all observed our reciprocal truce. It is strange how any form of life can be a welcome visitor in such a lonely situation—late evening visits from sidewinders excluded.

Time passes slowly but after about six hours I heard a yell and my help-seeking companion bounded into view. A tall Park Service ranger was with him. They carried me and my gear to a truck that was parked about a half mile away. The ranger drove for about 100 yards and the truck became stuck in the sand. Now we were four—the ranger, my companion, the truck and me.

A CB radio in the truck was line-of-sight and we couldn't arouse any one with it so we prepared for the night. I would be tied to a metal platform on the back of the truck to keep my back straight, and the others would sleep in the truck. As we went about preparing our beds, a light was spotted in the distance and we sent up a barrage of flares. The radio boomed to life and we learned that the light was from the car of another ranger who was out looking for his missing colleague. I was carried to the car and driven to the store at Stove Pipe Wells. We arrived there about 9:30 at night—some 12 hours after our initial leap into the valley.

After a series of intermediate hospital stops and a $400.00 ambulance bill, I wound up in a hospital near my home. Diagnosis was cracked vertebrae, compressed discs, and a cracked foot bone. Thirty-eight hours after the jump I was in a hometown hospital, anesthetized, cast in concrete, and on the road to repair.

So what did I learn from all of this that might be of value to others?

I learned (again) that you can survive under adverse conditions.

I learned the value, both real and psychological, of survival equipment.

I learned that a physical infirmity can make one stronger rather than weaker.

Perhaps the most important thing that I learned about survival is that the associated problems tend to compound one after the other. In this particular case there was the damaged foot, then the back problem, then the limited vision of my companion, then the truck stuck in the sand, and so on.

Like the instructors in the Air Force survival schools tell us—when you're planning for survival, anticipate the worst and plan for it.

That advice is right on. I learned that. ★

the urge



Hawk Two is rather surprised to see Lead disappear so quickly after rotation, but shrugs it off as the F-100 accelerates down the runway. Now, suddenly, with the increase in speed, he can make out only four runway lights, the fourth a hazy glow in the thickening fog. He increases back pressure as the airspeed says it's time to fly and the bird smoothly breaks ground. All outside references are gone and Hawk Two picks up his instrument cross-check with the confidence born of diligent practice, reaching for the gear handle, glancing down as he does so. Returning his gaze to the instrument panel, he is overwhelmed by the feeling that he is in a steep climb. He slams the stick forward

Impact occurred three seconds later, at 195 knots, 15 degrees nose low, 30 feet right of the runway edge. Hawk Two—man and plane—was dead.

Couldn't the pilot hack it? Obviously not. Was the accident preventable? You bet it was! Let's take a closer look.

By takeoff time the weather was actually below minimums, but Hawk Lead had promised the Ops Officer that these two birds would be available for the Monday morning mission and was determined to get home. Hawk Two was a junior birdman; assuming he had enough judgment to realize that he wasn't tiger enough to tackle the cruddy weather, it's likely he'd be reluctant to admit it.

It all adds up to *Get-home-itis,* a wide-spread malady which usually runs its course with no bad side effects, but which sometimes causes symptoms of severe fright or, all too frequently, a tragic disaster like the one above. The severity of the disease is random and unpredictable; its symptoms will show on a pilot one day and be mysteriously absent the next. Symptoms occur most frequently on cross-country proficiency flights, when the decision for Go or No-Go rests entirely with the pilot.

In a combat situation there is an obvious requirement to fly, sometimes despite extreme risk that has been carefully calculated and weighed against mission requirements. In the typical case of *Get-home-itis,* the need to press on exists only in the mind of the crew. Invariably, hindsight says the mission wasn't worth the loss. ★

EXPLOSIVES SAFETY

"DON'T PUSH YOUR LUCK"

JOHN H. KAWKA, Directorate of Aerospace Safety



EXPLOSIVES SAFETY AWARDS

Outstanding units contributing to explosives safety will soon receive recognition through the establishment of a safety awards program. Permission has been received to add such a program to AFR 900-26 during FY 72. The first awards will be presented for achievements during calendar year 1971.

Fundamental to the success of this program will be discretion in the number of awards presented. Two eligibility categories have been established. Category I will be for units up to wing level actively engaged in explosives operations. A total of five awards will be presented in this category. Category II, containing three awards, will be for organizations contributing to explosives safety through their roles in research, design, test and evaluation, logistics or training.

As organizational and functional differences preclude designing a rating system that can be fairly applied across the board, each command will have the prerogative to choose one nominee in each category based on specific achievements in and contributions to explosives safety.

Still to be designed is a distinctive emblem to symbolize the explosives safety function. This emblem is to be used as the central theme of the plaques presented to the award-winning units.

It is only fitting that design for this symbolic emblem come from the field. To encourage individual and organization participation, a $10 cash prize will be awarded for the winning idea, suggested design, sketch or drawing. Each entry should include colors to be used and a narrative description of the symbolism employed.

Send all entries to the Directorate of Aerospace Safety (IGDSGE), Norton AFB, California 92409 by 1 Sep 1971.

There have been too many unauthorized personnel fooling around with explosives and explosives components. Here are a couple of examples:

- An airman was trimming bushes when he found an item wrapped in waterproof material under the bushes. He opened the wrapper and noted the markings read "Simulator Booby Trap." Another individual then took a look at it and pulled the initiator cord. The item exploded in his hand, cutting and burning his hand and cheek.
- An airman standing guard at an aircraft removed three rounds of caliber .38 ammunition from his ammunition pouch. Out of boredom he tossed one round into the air and caught it with his right hand, which contained the two remaining rounds. One of the rounds exploded causing minor injury to the airman's right hand.

The airmen in both cases were very fortunate to survive with only minor injuries. We continue to receive TWXs stating in cold black and white that a guy lost his hands or arms when he pulled a pin or banged a shell with a screwdriver and hammer or pried out a primer.

It's too bad that people have to go through something like that before they take warnings seriously. Curiosity has and may cost hands—eyes—lives. Don't push your luck—DON'T TOUCH! DON'T DISTURB! DON'T HORSE AROUND WITH EXPLOSIVES!



NUCLEAR SAFETY AID STATION



HALFWAY SAFETY BENDS BOMB

The rear window of the tow vehicle had fogged over due to cold, humid weather so the crew opened the back door of the tractor cab to obtain better visibility while backing a loaded clip-in assembly into a storage cube. Obviously, better visibility improved safety. Then an unfortunate series of events started. The tractor tires began to spin on snow covered pavement. The door latch came loose and the door began to swing closed. Finally, the tractor slipped sideways, the door struck the bomb nose and was forced into the bomb by the side movement of the tractor. Sometimes you can't make a dime—but if the clutch had been disengaged when the wheels started to spin, or if there had been a safety latch on the door, bet he could have made a nickel! It's rather embarrassing to report these preventable problems, but we realize hindsight is much better than foresight. Your reports make it possible for others to know the hazards and help improve foresight. ★

"CLICK"--LOCKED,



OR

"CLICK, CLICK"--LOCKED?

Following download, two nuclear weapons were placed in a storage structure and the structure was certified as being locked. The next morning, maintenance personnel observed that the padlock securing the door was not locked. Investigation revealed that the intruder alarm system on the door worked properly and that there had been no alarm, hence no entry, since the time the door was supposedly locked. The type padlock in use required two distinct "clicks" before being locked and the key could be removed after the first click. You can easily surmise what happened. After the first click, the key was removed and, visually, the padlock appeared fully locked. The visual security checks during the night, of course, did not reveal the unlocked condition. Needless to say, this type lock is being replaced at that location with one that must be fully locked before the key can be removed. This is an example of equipment being designed to allow mistakes rather than prevent them. The security procedures were also inadequate to compensate for the equipment design deficiency. In this case a mistake was made which jeopardized the security of two nuclear weapons before the deficiency was discovered, reported, and corrected. How about your equipment and security procedures? Here is a classic example of a deficiency that should be reported as required by AFR 127-4. ★



IT HAD TO BE THE ... eng

MAJ THOMAS E. BOYLE, 6486 Air Base Wing, APO San Francisco 96553

When I first heard about the accident, I knew it had to be the engine. The pilot was the chief instructor pilot for our Aero Club and had over 4000 hours in the Cessna 150. It was obvious that he couldn't have been lost since the weather was VFR. It was clearly engine failure.

I thought about the accident as we flew out to the scene in a helicopter. The Civil Air Patrol said it was in the bottom of a ravine and both occupants appeared to be dead. Perhaps they were trying to make it to the ranch airstrip just a few hundred yards away. If only that engine would have lasted a few more seconds . . .

Jim used to conduct the monthly safety meetings for the instructor pilots so we knew *he* wouldn't take any chances around those mountains. True, he had been involved in an accident with a student pilot 20 months before, but his abilities must have been recognized because he became chief instructor pilot two months after that mishap.

When we reached the aircraft, both bodies had already been removed by Coast Guard and FAA personnel. Wonder what caused that engine to quit? Maintenance had been rated outstanding in the last two safety surveys.

When I asked the ranch manager if he had seen the aircraft make an approach to the field, he replied, "Yes, but I saw only the approach to the strip. I didn't see the crash beyond the runway."

"What were the winds like yesterday?" I asked.

"Just like today," he replied. "Coming down the mountain rather than the usual northeast wind. It gets a little turbulent when the wind blows this way," he added.

Jim knew about turbulence near the lee side of these mountains. He had been flying around them for years. Landing at the ranch in the prevailing wind would usually be a piece of cake, but landing in this wind could be a little tricky.

The wreckage was located on the mountain side of the runway. Why would he let the student turn uphill after a low approach . . . or was it a touch-and-go? Nobody witnessed the latter part of the approach.

We used a sling and a Huey helicopter to get the engine out. Our on-site investigation revealed no flight control malfunction. We wanted to get that engine back to the Base to find out what went wrong.

On the trip home, I kept thinking about the 60′ tree approximately 50 feet behind the wreckage. It hadn't been touched by the airplane. He must have stalled or spun to miss that tree. Jim would have taken con-



ne

trol before it entered a spin. He wouldn't let the student go so far as to put both of their lives in jeopardy before he reacted. Didn't he have 4000 hours in that bird? Yet if the aircraft ran into turbulence when it flew over the gulch and if it went into a spin while the student was trying to turn towards the upsloping terrain, the aircraft would be below the edge of the gulch in one turn if the spin started less than 670 feet above the ground. Then it would be too late for even Jim to make a recovery.

We took the engine directly to the reciprocal shop. Since it was late, we decided to start the teardown first thing in the morning. On the way back to the office, my supervisor and I talked about Jim's previous accident. I dug out the old report and took it home to read.

"Cross country flight . . . several touch-and-go landings, and a full stop landing. Following this, the instructor requested the student to execute a maximum performance takeoff. While in this maneuver, the instructor administered a simulated engine failure and during the recovery, the aircraft struck the runway and sustained major damage.

". . . the student had a total of 29 hours at the time of the accident. . . . When the instructor pulled the throttle to idle at 150′ in the air, the student—a large burly marine—pushed the control wheel full forward. The instructor got on the controls when the student didn't recover quickly enough and the aircraft struck the ground with considerable force with both student and instructor on the controls.

". . . The aircraft's engine was performing satisfactorily and continued to run at idle power throughout the impact with the runway.

"CONCLUSION . . . the instructor required the student to attempt to perform a maneuver for which the student lacked the necessary skill or judgment." THE MANEUVER WAS PERFORMED VERY NEAR THE GROUND AT A HIGH ANGLE OF ATTACK AT AN AIRSPEED VERY NEAR THE STALLING SPEED . . .

". . . The instructor did not brief the student

". . . The instructor did not demonstrate the desired procedures to be followed"

The conclusion was obvious: Jim was overzealous in pushing his student into a maneuver for which he was ill prepared and not briefed or knowledgeable on the proper recovery procedure.

I went to sleep thinking about those 4000 hours, and an engine teardown, and the possibility that maybe it didn't have to be the engine after all. ★

OPS TOPICS

NEW NASA FILM

NASA has released a 16mm color motion picture showing the areas of research in aeronautics that will be pursued in the 1970s. Entitled "Space in the 70s—Aeronautics," the 28-minute film discusses the problems that improved technology can help solve and on which NASA's research will be concentrated. Included are short haul aircraft, improved safety, and development of the space shuttle.

Prints may be obtained on one-week loan by writing to NASA Headquarters (Attn: Code FAD), Washington DC 20546, stating when the print is needed, or by calling (202) 962-4397. Prints may also be purchased for noncommercial use from the National Audiovisual Center, National Archives and Records Service, Washington, DC 20409.

FOR OUR NEXT TRICK

Two pilots in an OV-10 took off from a base in SEA and requested a closed pattern, which tower promptly approved. Coming around, they made a gear-up pass down the runway about 50 feet AGL. Three-quarters of the way down the runway the airplane pulled up and started an aileron roll to the left. As the bird came through the inverted position the nose dropped, and as the roll was completed the aircraft caught a concertina wire barrier. . . .

All the spectators were suitably impressed.

TWO SWITCH HITTERS

• Take a small fleet of Century-series fighters. Modify a portion of that fleet so that switch "A" on the fuel control panel turns off the fuel feed instead of jettisoning the belly tank. Then put a pilot accustomed to this mod into an unmodified bird. Guess what's likely to happen during engine shutdown. Then guess who was blamed for it.

• After about 30 minutes of flight, the F-100 pilot began to experience symptoms of hypoxia. He went to "100 percent" oxygen, but could not breathe at all and immediately started a descent to below 10,000 feet. Symptoms were severe, but the pilot was sufficiently conscious to respond to commands given by his wingman, even though he was unable to locate and actuate his emergency oxygen bottle. Below 10,000 feet the pilot was experiencing "jerks" and "spasms," but managed finally to actuate his bailout bottle. Return to home base and landing were uneventful.

QC met the airplane and discovered that the oxygen "On-Off" switch was in the "off" position, probably turned off by the pilot when he went from "100 percent" to "Normal" climbing through 10,000 feet.

Primary cause was assessed as operator factor, even though the "On-Off" switch is supposed to be safety-wired "On." The broken wire was still there. Two points seem safe to make:

A. If the safety wire was broken before flight, someone's inspection procedures aren't adequate.

B. If it is possible to actuate a safety-wired switch *inadvertently*, it isn't really *safety*-wired.

LATE PUBS

You can't fly safe without current Flight Information Publications (FLIPs), but many bases have been experiencing delayed reception. If the delays occur off base, ACIC may be required to initiate tracer action. However, if the delays occur on base, a step-by-step check should be made of base transit procedures, beginning with the base transportation officer or postal officer, until the cause of the delay is found.

GOOD JOB

The T-38 IP and his student had been airborne for 30 minutes when the left fire warning light lit up and the number one engine RPM started unwinding. Directing the student to shut down number one, the IP headed the airplane for home. Although the fire warning light remained illuminated for the duration of the flight, there was no other evidence of a continuing fire; however, a controllability check disclosed limited pitch control, and an uncontrollable pitch-up tendency with more than 30 percent flaps.

The instructor concluded that enough control was available to make a safe landing with less than 30 percent flaps, and made a straight-in approach using 25 percent flaps and 170 knots. Immediately after nosewheel contact, the aircraft pitched up, becoming airborne in an excessively nose-high attitude. The instructor was unable to lower the nose, but succeeded in making a single-engine go-around. His next approach was a wide, loose pattern to a straight-in at 160 knots, no-flap, and this time the aircraft stayed on the ground.

Investigation showed that the engine combustion case had ruptured, and the hot gasses had severed the fire detect system and damaged the left horizontal stabilizer quadrant to the extent that the nose down cable separated from the quadrant. All nose-down pitch commands utilize this one control cable; loss of the cable negated stick, trim and flap/slab interconnect nose-down commands.

Here's one case where a bad situation came to a happy ending, thanks to the pilot's professional skill.

FLIP CHANGES

VFR Supplement: The publication of parenthesized Daylight Saving Time as well as Zulu Time originally planned for the Airdrome Directory Section of both the IFR and VFR Supplements will be included in the IFR Supplement only. Therefore, aircrews using the VFR Supplement are reminded to utilize the appropriate adjustments for Daylight Savings Time when converting the hours of operation of a Facility/Airdrome from Zulu to local time.

Reminder: Daylight Saving Time will be effective from 24 April to 31 October 1971 throughout the conterminous US except Arizona, Michigan and that part of Indiana which is in the Eastern time zone.

"CRUMP"

A private pilot in an aero club aircraft taxied up to the gas pump to fill the bird's tanks after his flight. After deplaning, and discovering that he wasn't quite close enough to the pump, he jumped into the right seat of the airplane (the only door is on the right side) and started the engine in order to taxi closer to the pump. He got a little closer than he bargained for; this particular airplane has brakes available only from the left seat. *(Crump!)*

The HAIRY TALES column is open to anyone who has a message concerning safety, but would like to remain anonymous. If you have one of these experiences buried in your bosom, write it down and send it to us, signed or unsigned. Maybe your HAIRY TALE will save someone's life.



I'd been at Last Chance AB for five weeks, completing C-124 ground school, and was scheduled for an 0500 show for my first flight in "Old Shakey." The mission profile called for two hours of VFR pattern work, but as my IP and I headed for the airplane after a short briefing and a gulped-down cup of coffee, it quickly became obvious that Ma Nature wasn't going to cooperate: the morning was dark, cold and drizzly with ground fog. Weather had promised that the early morning sun would break up the ground fog, so, rather than pound the ramp, we decided to take off on time and fly GCAs until we could move into our planned VFR mission.

All went well until two or three minutes after takeoff. On GCA downwind I couldn't stay on my altitude or airspeed. A stranger would have thought the throttles were manual fuel pumps for the engines, the way I kept them moving. Radar advised us on downwind that a precision approach would not be available until 0800, when the operators came to work, but that they would be happy to give us a surveillance approach. I was having such a hard time maintaining level flight, I didn't even want to think about a glideslope, so I accepted the surveillance approach as a blessing.

I finally stumbled around the pattern to final approach and was told to start my descent. At eight miles from touchdown I was 100 feet high and I reduced power; at six miles I was 400 feet high and eased off some more power; at four miles I was 500 feet high and I again reduced power as the IP prodded me by saying, "The man said to get down, so let's get down!" In desperation I chopped more power. My final power setting seemed to make the IP uncomfortable, and shortly thereafter he commanded, "I HAVE IT—GO AROUND—MAX POWER!"

My first reaction was irritation with the IP for not letting me continue the approach, even if I was too high. Then I looked up from the panel and all I could see were trees and houses and a look of panic on my IP's face. The instruments still indicated that we were more than 1000 feet AGL, but we most certainly were not! After we regained our altitude and breath we tried troubleshooting our problem.

We obviously had some sort of trouble with our pitot-static system. The ground school had recommended the static drain valve in our lower compartment as an alternate static source, but when the valve was opened our instruments went wild. Airspeed dropped 40 knots, the altimeter went up 1000 feet and the VVI indicated a high rate of climb. All three instruments were fluctuating and the indications were so unbelievable that we closed the valve, returning them to their original readings.

We called the command post to advise them of our troubles and requested a chase plane, but none would be available for another hour. By this time the early morning sun was performing as promised and, as visibility improved, the IP chose to fly a wide visual pattern, using known power settings and aircraft attitude, flying the airplane right down to the runway and reducing power until we touched down. When we turned off the runway, our instruments told us that we were still 1500 feet in the air and doing 180 knots!

Maintenance quickly discovered our problem. Our airplane had been on the washrack the previous day, and the tape which had been placed over the static ports to prevent water from entering was still there.

(Good story, Hairy, but we wonder how you guys got through the takeoff, climb, and all the way around a GCA pattern without getting a clue.) ★

REX RILEY'S CROSS COUNTRY NOTES



Dear Rex

In 1965 I was a member of maintenance at _____. We worked our tails off and made what everyone considered an outstanding transient maintenance outfit. I note that the last time _____ was listed was (several months ago). What, pray tell, happened to have them pulled off? They sure have the facilities to be a top outfit. Just lack of interest?

Sincerely
Major _____

Rex gets quite a bit of fan mail and occasionally a letter that reads about like the one quoted above. We wish we had a good answer for the Major. One thing we do know is that a commander cannot simply take transient services for granted. As with every other activity on the patch, his personal attention will assure that it shapes up a little better.

To give some idea of what Rex looks for, here's a list of items covering arrival to departure:

Tower service, parking service and facilities, reception by TA, aircraft maintenance, availability of transportation.

BOQ, TAQ, messing facilities, flight planning facilities, weather service, clearance service.

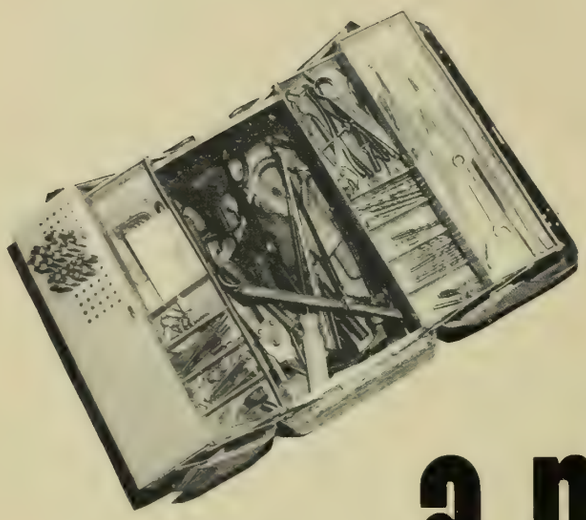
Flight lunch service, preparation of aircraft and forms, TA personnel available for departure, taxi directions and taxiway markings, runway/taxiway condition, departure and climbout procedures.

Self inspection has inherent dangers but I think that as objective a look as possible at your own facilities will give you a very good idea of whether they meet the Rex Riley standards. Comparison with services at other bases by local crews when they visit elsewhere will help nail down the problem areas. This will insure that transient services at all USAF air bases are of top quality. And that is what the Rex Riley program is all about!



REX RILEY
Transient Services Award

LORING AFB	Limestone, Me.
McCLELLAN AFB	Sacramento, Calif.
MAXWELL AFB	Montgomery, Ala.
HAMILTON AFB	Ignacio, Calif.
SCOTT AFB	Belleville, Ill.
RAMEY AFB	Puerto Rico
McCHORD AFB	Tacoma, Wash.
MYRTLE BEACH AFB	Myrtle Beach, S.C.
EGLIN AFB	Valparaiso, Fla.
FORBES AFB	Topeka, Kans.
MATHER AFB	Sacramento, Calif.
LAJES FIELD	Azores
SHEPPARD AFB	Wichita Falls, Tex.
MARCH AFB	Riverside, Calif.
GRISSOM AFB	Peru, Ind.
CANNON AFB	Clovis, N.M.
LUKE AFB	Phoenix, Ariz.
RANDOLPH AFB	San Antonio, Tex.
ROBINS AFB	Warner Robins, Ga.
TINKER AFB	Oklahoma City, Okla.
HILL AFB	Ogden, Utah
YOKOTA AB	Japan
SEYMOUR JOHNSON AFB	Goldsboro, N.C.
ENGLAND AFB	Alexandria, La.
MISAWA AB	Japan
KADENA AB	Okinawa
ELMENDORF AFB	Alaska
PETERSON FIELD	Colorado Springs, Colo.
RAMSTEIN AB	Germany
SHAW AFB	Sumter, S.C.
LITTLE ROCK AFB	Jacksonville, Ark.
TORREJON AB	Spain
TYNDALL AFB	Panama City, Fla.
OFFUTT AFB	Omaha, Nebr.
ITAZUKE AB	Japan
McCONNELL AFB	Wichita, Kans.
NORTON AFB	San Bernardino, Calif.
BARKSDALE AFB	Shreveport, La.
KIRTLAND AFB	Albuquerque, N.M.
BUCKLEY ANG BASE	Aurora, Colo.



a place for everything

SQDN LDR KEITH H. JOHNSON
474 FMS, Nellis AFB, Nevada

The following article is presented in hopes that it will stimulate thoughtful approaches toward dealing with a recognized problem area; views presented are those of the author, and do not represent an official USAF position. Interested USAF units who feel that the proposed procedures may be adaptable to their use can acquire further information on the CTK by writing to the editor.

On a typical USAF base there are roughly half a million tools used by about 2000 people. Most of these people work directly on the airplanes or engines. Any one of those half a million tools can be left in the wrong place. When it happens, and it has, the result can be disastrous. Since 1965 the sad story is:

- 15 aircraft destroyed—tools a cause or possible cause (tools found in wreckage).
- 12 deaths resulting from these crashes.
- 25 instances of controls jammed by tools.
- 25 instances of engine damage from tool ingestion.
- 9 cases of inflight fire or other miscellaneous damage or malfunction caused by tools.

Now, the interesting thing is that throughout this period 1965 through the present, the Air Force *has had* tool control systems. They vary from command to command, but the basic theme is this: Each man has a tool checklist; when he takes a tool out to work on an aircraft he notes it on the list; when the tool is returned to his toolbox he deletes the notation. It reminds me of King Canute standing on the beach and ordering the tide not to come in.

King Canute thought his authority was enough to override the gravitational effect of the moon—but, then Old Canute wasn't the world's greatest physicist. These days we *must* understand the physics of hu-

man variation if our procedures are to work. Given our present systems and considering the physics of human variation and workplace dynamics, what is the likelihood that a technician will ignore/forget the tool control procedures and not be detected? The answer is—very likely! And this answer leads inevitably to the next question: *If the present procedure is less than perfect, have you got a better system?*

Yes, I think I do have a better system. It's cheaper, it's easier, and —most important of all—*it works.* It has been tested on three continents, by four military air arms (the RAF, the RAAF, the Canadian Armed Forces and the US Navy). There's just one problem: changing a system requires effort and energy, so don't read any further UNLESS you are prepared to evaluate the system objectively and then *act on it* if you conclude that it has the advantages claimed.

The system is called the Composite Tool Kit (CTK) and it has three key features:

(1) Under CTK there are no individual tool boxes.

(2) Each kit is designed according to task location, and contains sufficient types and numbers of tools to support the people who will be using it.

(3) Affixed to each tool kit is a control board with appropriately numbered and colored disks. These disks are used to identify each person who draws tools from the CTK.

Let's look at a typical CTK in operation. Our sample CTK is for an aircraft Phase Dock and at any one time up to eight people may be using the kit. There may be more than one aircraft involved. Figure 1 illustrates the control board which is used with the kit.

• At the start of the shift, Airmen Smith and Jones write in their names against green/black disks #1 and #2, respectively. Green/black is the color assigned to aircraft #197, and both these airmen will be working on that aircraft.

• As they take tools from the kit, they put one of their numbered disks in place of each tool. (This shows *who* has *what* tool and *where* he has it.)

• At the end of the shift, or when work on the aircraft is finished, each man returns the tools he used to the kit and returns the disk from each tool space to the control board.

• At this time the Dock NCOIC checks the board. He has, incidentally, kept a fatherly eye on the kit throughout the day. If a tool is missing the NCOIC initiates a search, in the area and on the aircraft, until the tool is found and returned to the kit. He then *knows* that every tool that went to the aircraft is back where it belongs.

This description of its operation sounds too simple. Right now many of you are saying, "What if someone stole a tool—you won't find that one!" or, "What's to stop a man

NCOIC TOOL KIT: MSgt KEEN			
WORK SUPERVISOR		WORK SUPERVISOR	
SSgt SOLD		TSgt CONVINCE	
AIRCRAFT #197	SPECIALIST NAME	AIRCRAFT #065	SPECIALIST NAME
1	Smith	1	Kelly
2	JONES	2	
3		3	
4		4	
SPECIAL TOOLS - TOOL CRIB			
TAG	TOOL TYPE	TAG	TOOL TYPE
1	Tension Wrench		

FIG 1. Typical control board for Composite Tool Kit

from using someone else's disk?" or, "The NCOIC will have to guard the kit!"

Be patient; these questions will be answered. But first let us return to the three key features and look at each more closely.

First, how do you get by without tool boxes? You get by very well! You ensure there is an adequate range of CTKs throughout the unit, each one designed for the shop, dock or flightline area it serves. Normally, no more than 300-400 tools are needed per kit; the precise number needed is determined by examining how many people doing what jobs will use the kit. The kit in photo A has 260 tools and is used by an engine dock crew of four men. It replaces four individual boxes, each of which had 200 tools. In six months of use there has never been a time when a man had to wait for a tool because those he needed were in use. (Incidentally, during the same period there were no losses from the kit.)

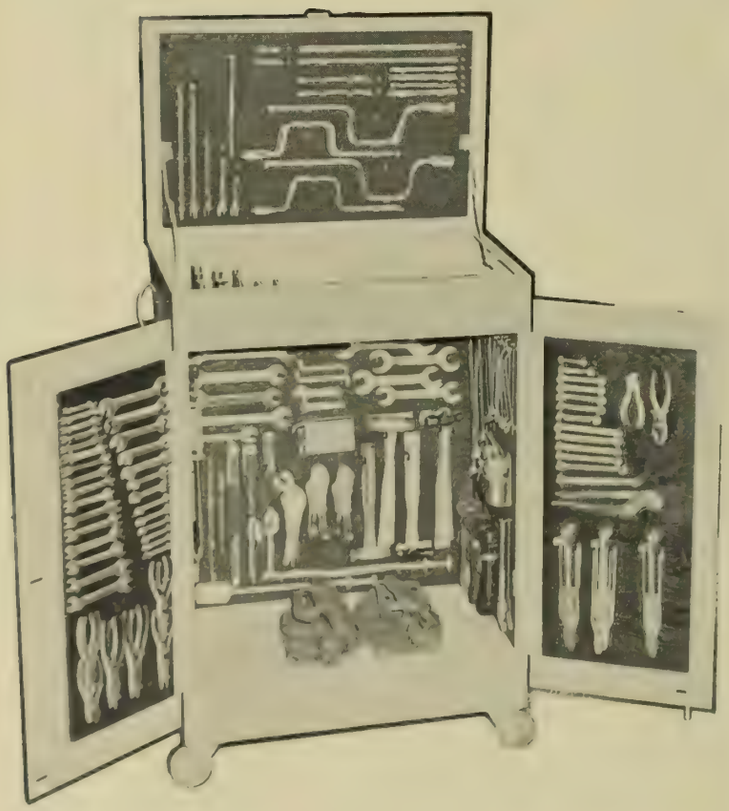


PHOTO A.
This four-man CTK of 260 tools replaced four tool boxes of 200 tools each.

Typically, you could expect to have the following distribution of CTKs: one CTK per eight small aircraft; one CTK per two to four larger aircraft; one CTK per four-engine aircraft, particularly when there's a parking location problem; one CTK per engine dock; one CTK per phase dock; one CTK per specialist shop (where equipment is maintained in shop); and one CTK per AGE dock. Additionally, CTKs would be needed to cover shops that split several ways on deployment.

Actual studies at a TAC base showed that an F-111 squadron, operating under the squadron maintenance concept, would need 40 CTKs replacing 300 individual tool boxes.

Secondly, the shadowing principle is in large measure responsible for the success of the CTK system, for it enables the kit to be inventoried, visually, at a glance. In fact, studies show you can visually inventory a shadowed CTK in about 20 seconds, versus 45 minutes needed for a conventional tool box. A bright yellow shadow on a black background seems to do the best job of providing the visual stimulus needed to show a tool is missing, but any contrasting color scheme (even black and white, as in photo B) will suffice. The pattern of tool layout is also a big help, both for detecting absent tools and for guiding a technician's eye straight to the tool he needs (a big improvement over the "lucky dip" system of a conventional tool box). The loss of a tool—that is, a shadow without a control disk—can be detected at a glance. Thus a supervisor who does nothing more than cast an eye periodically

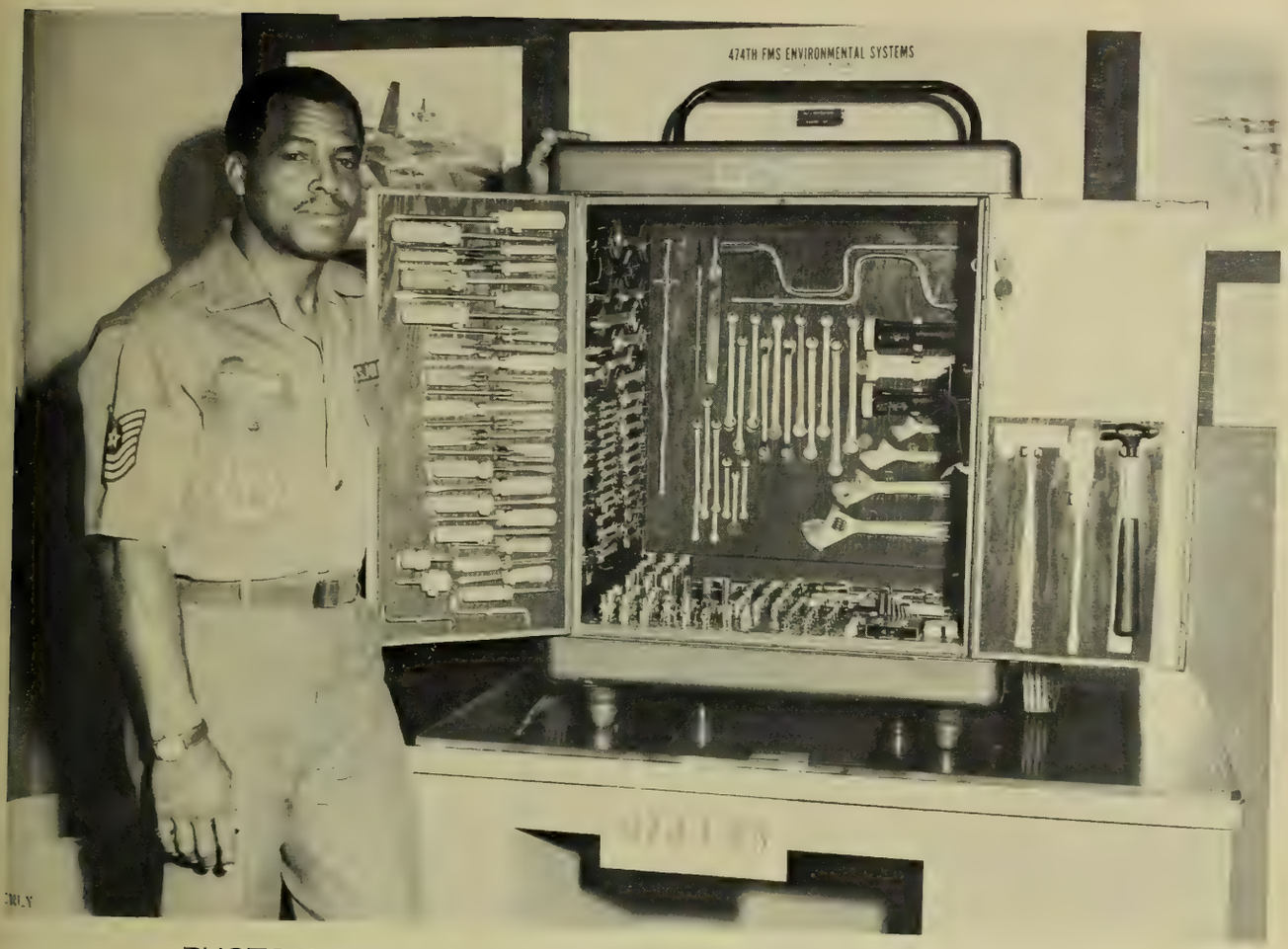


PHOTO B. Missing tools are easy to spot, even in black and white.

over the kit *knows* instantly if a loss or unauthorized use has occurred. Photo B shows a CTK with tools missing—and even in a photo the telltale effect of the shadow is obvious. The supervisor can therefore initiate action while the trail is hot. Whether a tool is stolen, lost or left on an aircraft, he is immediately alerted and can act accordingly. His people know what they are looking for, and so the search centers on the specific tool, not just FOD in general. If any of these people suspect that the tool was stolen—and they have an idea about who stole it—there is a tendency to arrange for the culprit to "find" the tool. This saves a lot of needless work and lost time on their part. In practice, everybody using the kit develops a protective attitude toward it.

The third feature we need to discuss is the control board, shown in photo B and illustrated in figure #1. This is an eight-man, two job board, the green/black disks assigned to one job, the green/white disks to the other. A good, workable approach might be to have 15 copies of each disk hung on the board; this would allow each man to draw up to 15 tools. It is rare to find that more than 15 disks are needed by any one technician.

If the same people use the CTK over a long period (say, three months), their names can be painted in against a particular number. If, however, the people using the kit change from day to day, then the name space should be left blank. Then, as each man goes to the kit for the first time, he inserts his name in wax pencil in the next vacant space. That number is then his for the duration of his work on that job, whether for a few hours or a few days.

The board can be designed to have space for as many individuals as the job is going to need. Up to ten, 15, or even 20 spaces for technicians (together with appropriately numbered disks) can be created just by varying the size of the board. This should, of course, be decided before the CTK is built, and the board made to suit the need.

Finally, it is necessary to control tools which come from the Tool Crib—outside the shop—and which

would not be contained in a CTK. This is done with a very simple dual-control system: A control board in the Crib identifies which tools have been issued to what job and what technician; then, as the tool from the Crib is brought to the job, the technician puts a tag in the Special Tools section of the CTK control board and writes in the name of the tool (see Fig. #1).

The same principle applies to tools brought from specialist shops. Both the specialist shop control board and the CTK control board are used to show *who* has *what* tool and the job it is used on.

Those are the basics of the CTK system. Now for the facts on its use and history:

- The RAF has used this system since the early 1960s. Initially it was optional; it is now mandatory.
- The RAAF has used the system since about 1964. It is optional, but is used by all flying squadrons and some non-flying squadrons, e.g., ground telecommunication units.
- The CAF appear to be in the process of adopting it, if not already done so.
- The U. S. Navy has an active evaluation program, and the CTK system is in use at at least one Naval Air Station.

Detailed statistics are not available; however, reliable sources in the RAF state that the incidence of tools found in aircraft has decreased significantly. On those rare occasions when tools have been found, they have been traced to civilian contractors who worked on the aircraft concerned during IRAN or modification.

So far I've stressed the safety aspects of the CTK. The CTK system also offers the opportunity to save a considerable chunk of money (see Fig. 2). Taking a typical TAC Fighter Wing as an example (and even allowing for extra CTKs to cover deployment), we can replace 1150 tool boxes with 170 CTKs. We thereby reduce our tool inventory from 215,440 tools to 51,600 tools, an inventory reduction in excess of $120,000. Annual wastage from breakage, loss etc., is similarly reduced, from 16,500 tools costing $12,200 to 3950 tools costing $2900 —an annual savings of $9300.

ECONOMIC COMPARISON: INDIVIDUAL TOOL KITS VS CTK FOR A TAC WING

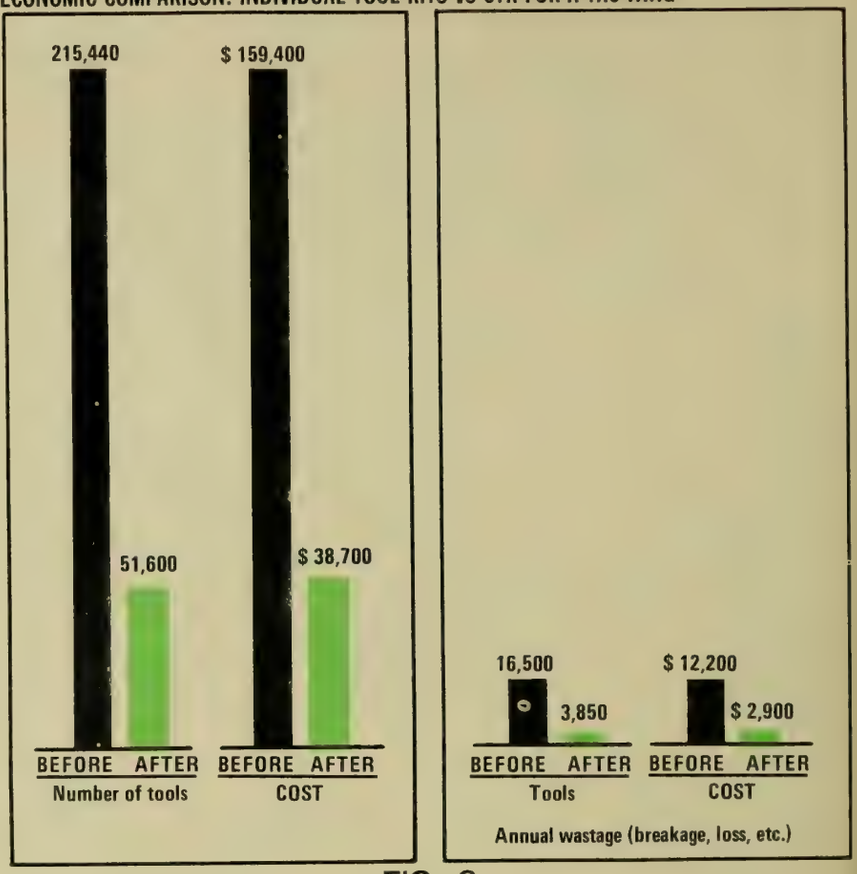


FIG. 2

Depending on how you go about it, the cost of the conversion discussed here would vary from a low of about $6000 to a high of $23,-800. The higher figure assumes that all items (boxes, clips, etc.) are purchased through GSA; the lower figure assumes local manufacture and individualization of each CTK container and local purchase of clips. If you're careful, it's possible to convert to the CTK system and still net a first-year savings of $3300 (from annual wastage), in addition to that whopping $120,000 inventory reduction!

And you MIGHT save an aircraft or two. Maybe even a pilot!

So there it is, once over lightly on the CTK system—a cheaper, easier, more efficient and safer way to do the job. I've dealt only with the basics, and any manager can extend these basics and add quite a few touches of his own. There are just two ground rules for CTK that must never be violated:

- SHOW—All tools must be shadowed onto their boards, one tool per shadow.
- KNOW—There must be a simple control system which allows supervisors to know who has what tool on which job—at all times.

Now it's up to you. ★

Tech topics

briefs for maintenance techs

MAINTENANCE CREDIBILITY GAP

Capt Rafael A. Goyco
Directorate of Aerospace Safety

I have just received the repair bill for my motorcycle. The total came to 300 percent more than the price initially quoted. Although the original problem was a high speed misfire requiring a tune up, a piston and bore job was also accomplished. This inspired remedy was performed prior to thoroughly checking the carburetor, which was eventually found to be the culprit after the piston job did "not quite" remedy the problem.

Although the possibility exists that I was "taken," an explanation less bruising to my ego is that poor troubleshooting techniques were used by these so-called **mechanics.** This expensive incident made me review some of my past experiences as an aircraft maintenance officer. Could this be the reason why we have the famous hangar queens? How many times have you as a maintenance man been plagued by recurrent discrepancies on your aircraft? How many answers like the following have you received on an EUMR submitted by your organization?

- Functional tests of the pressure switch revealed it to be within its correct limits.
- Thorough evaluation of exhibit pump failed to detect any condition which may have caused operational condition reported. It is probable system components other than the pump caused fuel feed problem.
- Since bench test did not confirm the complaint, it is concluded that exciter was serviceable when removed.

Qualified maintenance people and good troubleshooting performed with the help of the tech orders could have prevented the manhours, headaches, and transportation costs incurred by submitting UMRs on items that were not defective in the first place.

I can visualize the chagrinned look of the technicians when they see their bird come back from an aborted mission with the same writeup that they supposedly fixed the day before. Granted, our systems are extremely complex and getting more so, but good maintenance and use of technical orders will save our Air Force countless manhours and dollars by getting the job done right the first time; not changing a piston when only a tune up was called for.

* * *

ANOTHER EGRESS GOOF

A young airman was dispatched to an F-105 to perform an equipment change. When he arrived at the Thunderchief, both canopies were closed. Seeing the door labeled "Rescue" and thinking this was the way to open the canopy, he opened the door and pulled the rescue lanyard out the required six feet.

The system operated as designed. Both canopies jettisoned, fortunately with no injury to the young airman but the bird wasn't so lucky. It received extensive damage to both canopies and two dents to the fuselage. It appears that this accident was caused by personnel error—"not completely familiar with the egress system," but how about you managers and safety officers? Is your supervision at the operator level effective? Would you knowingly dispatch someone unqualified, unfamiliar and uncertified to the aircraft? It's too late to prevent this accident, but must there be a next one?

* * *

DISCONNECTIONITIS

Putting an end to all the little omissions and commissions that can cause aircraft accidents is somewhat like the three-legged cat trying to corral five mice. It ain't easy. **Connectors,** for example, continue to be the source of many headaches. Even a three-level

TECH topics

ought to know that a **properly secured** connection means torquing, when applicable, or the installation of a safety device when one is required. Nevertheless, we still have those pesky connector problems because **someone didn't do the job right** and an inspector didn't **thoroughly inspect.** Items: When a T-29 pilot moved the mixture control **nothing happened** to the mixture. Firewall shutoff was used to shut down the engine Maintenance checked They found the **nut had backed off the control arm.** When the nut is **properly** secured and keyed **it won't come off.** Simple as that!

Or . . . throttle movement on an O-1 produced **no result** RPM remained at 1700. The throttle cable **wasn't properly secured** to the carburetor.

Another T-29 . . . Three minutes after takeoff . . . still climbing . . . RPM 2400, manifold pressure 38.2. Fuel flow dropped to 400 pph . . . engine torque to 55psi. The "B" nut on the fuel line at the fuel flow transmitter **was loose and leaking . . .**

C-130 . . . Crew lost directional control during the landing roll. Why? The torque arm (scissors) connecting bolt was **missing.** Why? The bolt and lock arm **weren't properly installed.**

Remedy? **Follow the TO.**

* * *

MORE CENTS THAN SENSE

The C-123 was on an aircraft commander upgrade mission. After two hours of flight, a simulated assault pattern using full flaps was accomplished. The pilot touched down and applied reverse thrust and normal braking.

After 1000 feet of ground roll, the crew heard the screeching of metal-to-metal contact and at 40 knots the anti-skid light illuminated. The aircraft came to a complete stop without further incident, and the loadmaster got out to check the aircraft. He found the right wheel cocked on the axle.

Further investigation revealed that the wheel retaining nut safety bolt was missing, allowing the wheel retaining nut to tighten to the point of bearing failure. The extreme heat from the overtorqued retaining nut melted the bearing rollers and fused the retaining nut to the axle.

The aircraft was returned to operational status in 48 hours, for a total cost of $2,866.56—a large price to pay for a small safety bolt.

* * *

IMPROPER ATTACHMENT

About 40 minutes after takeoff, the pilot felt an explosion that resembled a compressor stall, followed by an odor like gunsmoke. After returning to base the pilot depressurized the cockpit and unlocked the canopy, which immediately blew to the vertical position, remained for 5 to 10 seconds, then fell closed.

The canopy remover had fired without the assistance of other components used in the normal removal sequence. The canopy remover, canopy actuator and immediate area were too hot to touch. The hose to the canopy remover showed no indication of exposure to initiator gases.

Finally the cause became clear. The clamp and gasket attaching the hot air supply line to the equipment cooling package, which is located aft of the pilot's seat, was misaligned allowing a jet stream of 800°F air at approximately 175 psi to escape. A portion of the insulation around the hot air line had been burned and blown away. The female half of the cannon plug attached to the bypass valve assembly was found with the solder melted and the plug loose in its case.

The investigation revealed that the volume and extreme temperature of this air leak was sufficient to cook off the canopy remover.

The best material and the best design are wasted if the seals and clamps are not properly aligned during installation. Quality work in all maintenance procedures is the answer.

* * *

COULDN'T TAKE THE PRESSURE

The following three incidents were chalked up to materiel failure. Regardless of the cause factor, they were costly and dangerous. Close surveillance by maintenance might have prevented an incident or accident.

We are talking about tire failures on T-38 and T-39 aircraft.

• During landing roll a T-39 crew experienced what they thought was a blown tire, followed by hydraulic system failure. Investigation revealed that the entire tread on the right main gear had separated, making a hole and dents in the trailing edge of the wing inboard of the right flap, bending the right main gear actuating cylinder, and tearing hydraulic lines from the gear actuating cylinder and the gear uplock cylinder. Parts and labor ran $4,320.54.

• At liftoff the crew of a T-38 felt a slight bump and saw one of their main tire treads go rolling forward, An uneventful landing was completed on the tire body which did not deflate. Investigation revealed that the tread had struck the forward gear door link causing $100.00 worth of damage.

• After gear retraction the T-38 crew noted a red light in the gear handle. They reduced airspeed from 265 to 240 knots and recycled the gear, and the red light went out. Visual inspection by another aircraft indicated the T-38 was clean. After completion of the mission the tread was missing from the right main tire. The only damage this one caused was to the tire itself.

These incidents do indicate materiel failure as the cause factor. However, any one of the above incidents could have been caused by under inflation. An under inflated tire may go several missions without failing, then, after being inflated to the proper pressure, fail on the next takeoff.

The failure will almost certainly be listed as "materiel failure"—just as these examples were. Proper inflation will usually vary with gross weight and **must** be done in accordance with the Dash 2.

* * *

MISSILE MINUS WING

During a poststrike battle damage check, the wingman noted Lead's F-4 was damaged. As a precautionary measure, Lead made an approach end arrestment.

Postflight revealed that an AIM-7 missile wing had separated and struck the aircraft left wing and flap. The cause for the failure was traced to the munitions load crew who failed to lock the wing into the missile. All load crews at this base have since been briefed on the necessity for using the missile wing lock Go-No-Go gage when installing the wings.

* * *

A REASON FOR THE BOOK

During an FCF the pilot of an O-2B feathered the front prop but couldn't unfeather it. Maintenance found out why: the propeller accumulator was overserviced by about 100 percent—225 psi versus TO pressure of 100 to 125 psi. Could this be another case of failure to follow tech data? That book was written for a reason.

* * *

A MURPHY BOLT

Correct use of tech data is vital for us mechanics in maintaining modern high performance aircraft. The following incident indicates deviation from specific tech data during maintenance on a flight control system. Although, in this case, the aircraft landed safely, there could have been a disaster.

A T-38 was on GCA final approach. When round-out for landing was attempted, aft control stick movement was restricted to the neutral position and sufficient round-out could not be attained. Max power was selected for go-around, and the increased thrust raised the nose enough for a successful landing.

Investigation revealed a maximum fore and aft control stick movement and corresponding horizontal slab movement of two inches. When access panel 47 was removed, maintenance found that the forward bolt on the slab trim actuator had partially fallen out. This bolt, **installed from the bottom,** as depicted in Fig. 17, TO 1T-38A-4-3, was prevented from separating completely by the proximity of panel 47. The bolt had caught between reinforcement ribbing of the panel, restricting stick movement. The castellated nut had not been cotter keyed during actuator installation.

Inspection of work accomplished in areas that affect safety of flight is mandatory. Had such an inspection been properly performed, this incident could have been avoided.

* * *

INSPECTOR, OPEN THY EYES

Immediately after takeoff for an FCF the C-123 engineer noted a slight oil leak on the number two prop control; then the drain plug on the bottom of the control unit fell out, followed by all the oil. He immediately notified the pilot, but with all the oil gone, the prop could not be feathered. A successful landing was accomplished with Nr 2 prop windmilling at 2300 rpm. Investigation verified the missing plug; there was no indication that the plug had been safety wired.

Inspection of the forms revealed that the prop change prior to takeoff had been properly documented. The work was signed off by a qualified mechanic and inspected by a qualified inspector. This brings up the point that has been brought up many times before: if you put your name to the forms indicating you have inspected something, you better do just that —**inspect it.**

Aircraft Contro

NYLON JACKETS

P. L. SMITH, ASD, Wright-Patterson AFB, Ohio

Modern jet aircraft impose increasingly severe operating conditions on control cables. Cable systems are more complex and are difficult to maintain with the wider temperature extremes, corrosive fumes of jet engine exhaust, and the various vibrations associated with high speed flight, not to mention the usual dirt, grit and other contaminants in the atmosphere and on the ground. Cable wear in control systems has been caused mostly by abrasion; however, cable damage due to flexing and misalignment is not uncommon at quadrants, pulleys and fairleads. In many cases, maintenance and inspection techniques are marginal to detect abrasive wear of cables early enough to prevent in-service cable failures.

Special emphasis should be placed on examining all cables where they come in contact with any surfaces (such as in Fig. 1). Inspect the cables for dark shiny spots that could range in length from one-half inch to several inches. (See Fig. 2). If you find any, the cable should be disconnected and flexed (as shown in Fig. 3) to determine the extent of damage. Experience has indicated that control cables can wear as shown in Fig. 3 in less than 100 flight hours.

Severe cable problems on several major aircraft systems led the Aeronautical Systems Division to conduct special cable tests, using bare cable and cables with 1/64″ and 1/32″ thick nylon jackets.

Flight test results were very conclusive: *nylon jacketed cables are far superior to bare cables under all conditions.* Non-control system vibrations transmitted to the cable through pulleys, fairleads, and cable guides were greatly reduced, since the nylon jacket acted as an absorbing cushion. Dirt and grime could not reach the protected cable. The lubricant applied during manufacturing was sealed in, providing a continuous low level of internal friction and wear. The insulating prop-

Cables Now Wear . . .

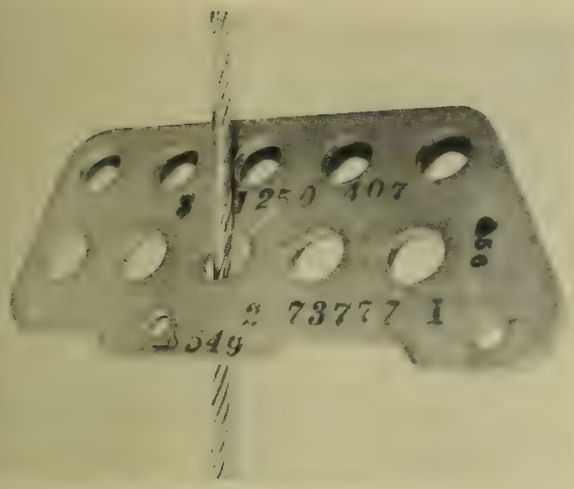


FIG. 1

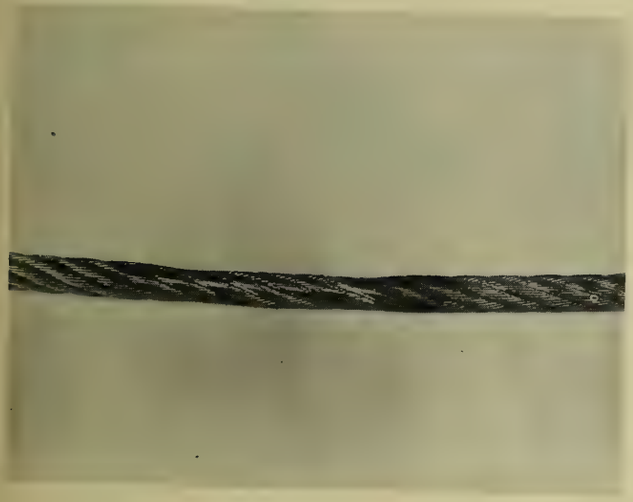


FIG. 2



FIG. 3

erties of the jacket appear to protect the cable from sudden temperature changes. Sulphur and other corrosive elements no longer contribute to cable corrosion and the detergents used in washing the aircraft have little effect on the internal cable lubrication.

To date, the tests verify that nylon jacketed cables can perform around molded phenolic aircraft control pulleys without splitting or peeling. Nylon jacketed cables can and have solved several application problems in current flying aircraft and ground-support equipment. However, flight tests on T-38 and C-141 aircraft are continuing to determine the maximum capability of these nylon jacketed cables.

Research on inspection criteria for nylon jacketed cables is continuing with both laboratory and service tests. Until such procedures are established, the cable should be inspected for any cracks, seams, lumps or changes in uniform thickness. The section of cable that comes in contact with a pulley should be carefully checked for reduced cable diameter, which could indicate nylon stretch and a broken cable.

Additional information can be obtained from ASD/ENFL, Wright-Patterson AFB, Ohio.

a new net

LT COL DAVID L. ELLIOTT
Directorate of Aerospace Safety







The MA-1A net type barrier, in use in the Air Force since 1952, has been only about 65 percent reliable, but many pilots are alive today because of it. The MA-1A barrier consists of a net attached to a cable lying on the ground. When an aircraft nose gear engages the net the cable is lifted to engage the main landing gear.

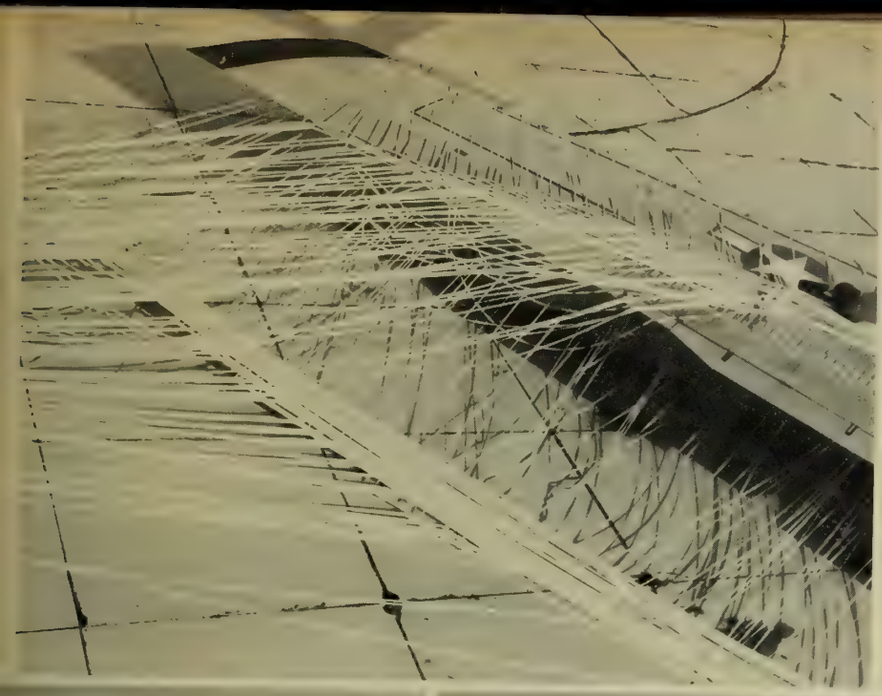
Later in the 1950s, the SAFE-BAR, another net engaging system, was developed in Europe. This barrier had an upper and lower cable with vertical nylon straps that would engage the wing of the aircraft. The successful engagement rate was much better than that of the MA-1A system; however, during high speed engagements, the upper cable could cause damage to the fuselage and on aircraft like the T-33, the upper cable could be pulled down through the canopy into the rear cockpit.

Either of these engaging devices could be connected to different arresting motors. For example, the MA-1A was originally connected to anchor chains; later it was also interconnected to a BAK-9 arresting system and feasibly could be connected to other type arrestors. Ditto for SAFE-BAR.

Advantages of the MA-1A over the other nets is its simplicity of operation and maintenance, and low profile in the erected position. It can be left up for almost all aircraft movements and operation of the system can be remoted to the tower. The remoted configuration is generally required on civilian/ANG or USAF joint-use bases. The SAFE-BAR had a higher profile because the upper cable had to be high enough to clear the cockpit during engagement. This higher profile made remoting the system an important consideration for installation.

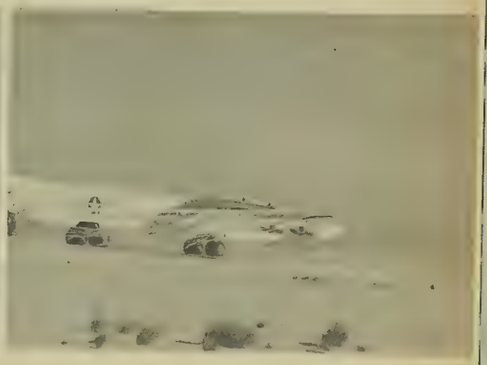
For years the MA-1A and SAFE-BAR were the principal aircraft arresting barriers. They were for emergency-only, far-end arrestments. It is recognized that the success rates were not very shiny but enough aircraft were saved to make it very worthwhile.

During the late 50s and early 60s the Air Force configured all century series fighters with tailhooks.









The hook cable arresting system at the departure end for tailhook engagements became the objective. The high success rates the Air Force encountered with the tailhook was one reason that development of nets was limited from 1960 till the present. But a subtle problem developed that did not become evident until the mid 1960s when arresting system usage increased radically. This was the limitation of "added on" tailhooks to the century series fighters.

The evolutionary growth of systems to arrest heavier aircraft, and the development of tailhooks built just a few degrees stronger than existing arresting systems, resulted in an incompatibility problem when stronger arresting systems were developed. Unsuccessful engagements occurred as a result of broken tailhooks and arresting system failures. It then became apparent that retention of the MA-1A net was a necessity if we were to keep landing accidents to a minimum. Meanwhile, with development of the hook/cable, improvement of the net systems ceased. The thinking probably was that improvements in the net system would be at the expense of the hook/cable system. To a certain degree this may be true; there is only so much money.

Recently we have seen a great improvement in nets that could perhaps improve the reliability under emergency conditions to a point equal to the hook/cable systems. Last December, industry, under FAA sponsorship, conducted tests of a new type net. The net system was designed in France; the arresting motor was designed in the United States. The net and arrestor were married at Edwards AFB, and a B-52 weighing 305,000 pounds was successfully engaged and arrested on three separate occasions at speeds up to 115 knots, with no significant damage to the B-52. As an observer of one of the tests, my first reaction was, this system could have saved at least five B-52s or 135s in the past three years.

This particular net, which is enormous in size, and the arresting motor, also huge, operate on the principle of the BAK-13, i.e., rotary hydraulic. The tapes wrapped around the drums of these reels are 0.40 inch thick and 18 inches wide. Numerous steel bolts, one and one-half inches in diameter, are required to anchor this system to the foundation. The net is 36 feet high and is





Upper Photo—Test aircraft has just entered the net. Note rubber supporting tubes draped over wings. Lower Photo shows enormous size of tape attached to nylon webbing—0.40 inch thick by 18 inches wide.

supported in the center by four rubber tubes filled with air. (The tubes supported the net and did only superficial damage to the wings of the B-52—about like a bird strike on the leading edge of the wing.)

As the aircraft traveled through the net the vertical straps began engulfing the wings and were laced across the wings from tip to tip. They produced no side loads to cause damage to the pylon mounted engines. Most impressive is the way the net engulfs and laces itself around the leading edges of the wing. The upper and lower straps are made of nylon, not cable, as in the SAFE-BAR system. Thus, the brutal damage caused by cables being pulled into the fuselage does not occur with this net. From the photographs across these pages you can see the sequence of events as the engagement progresses and as the aircraft is brought to a stop. The particular net used in the test was designed for the Concorde supersonic transport, yet it successfully engaged and stopped the B-52. A newer net being designed for the B-52 and KC-135/707 type aircraft will be superior to this net in decreasing loads on wings of wider span and lower sweep angles than the Concorde's double delta. A net similar to this but on a much smaller scale has been used successfully in Europe to arrest fighters. It works on the same principle and has proven very reliable.

Perhaps the time is ripe for each commander to review his operational requirements and, if warranted, submit his required operational capabilities for a net type system for his individual needs. A quote from the 1969 arresting systems summary states, "The MA-1A system is still being maintained. A modernization program is needed to replace the current net with a more sophisticated system that is compatible with more aircraft types and not so dependent upon a rigid speed envelope or aircraft configuration. Two companies have designed net type systems that are superior to the MA-1A, and can be attached to any energy absorber from the anchor chain to the dual BAK-12. This opens the possibility of successfully arresting such aircraft as the T-39, C-9, B-57, B-66 and any aircraft where the speed/weight combination is compatible with an energy absorber. Installed as a backup system, this net could further reduce accidents when a hook-equipped aircraft fails to engage the primary system." ★



Dear Toots

I have a couple of questions on TO 00-20-5, para 1-36, page 1-5: Was the intent of this paragraph to allow a complete change of flight crew with engines running or to allow changes within the crew with the same pilot or copilot resuming the flight? After engines are shut down, must the same pilot resume the flight or merely remain in the area until another flight crew arrives at the aircraft?

We are not in the airline type of operation here and I am under the impression that any time the engines are shut down and another crew will take the aircraft, it must have a BPO inspection and a preflight by the flight crew.

Mr S.

Dear Mr S.

According to the OPR on TO 00-20-5, the intent of paragraph 1-36 was not to allow complete change of crew with the engines runnning. The paragraph was intended, rather, to suit the needs of units with a training commitment and allow a change of student with the IP remaining aboard, or the IP to deplane and let the student go solo. However, if an operational requirement for a complete crew change exists, there is nothing in the paragraph to prohibit it.

If the engines are shut down, a new basic postflight inspection is still not required of Maintenance if the same pilot or instructor pilot will remain in command of the aircraft on the next flight, provided that he stays in the immediate vicinity of the airplane while it is shut down.

Hope this answers your questions. Thanks for writing.

Toots

Dear Toots

There seems to be some confusion here in the control room about the intentions of AFM 65-110 on reporting aircraft undergoing periodic (we are in the periodic concept—400 hour interval.)

My question is, when do we close out the periodic status and carry the bird operationally ready? Do we report "periodic" or "unscheduled" during the post-dock portion of the periodic? After functional check flight do we report "unscheduled" or "periodic" while clearing the test pilot's write-ups?

Concerned

Dear Concerned

I researched the explanation and terms portion of AFM 65-110. To answer your question, the aircraft is reported in periodic Code C through all portions of the pre-dock, in-dock and post-dock. At the time the aircraft becomes operationally ready for functional check flight the 359 card Code C (periodic) will be closed out and the aircraft will be reported operationally ready. Maintenance resulting from a functional check flight will be reported as unscheduled Code A.

Toots

MAIL CALL



Apologies to MrNewman

In the February issue on page 29 you stated that a movie starring Steve McQueen had the following line "What we have here is a failure to communicate."

Would you believe the line came from a Paul Newman movie? Regardless, it is a great and informative magazine.

SSgt Robert Carroll
24 SOWg
Howard AFB, CZ

What we had there was a communications failure!

* * *

"Time to go"

The February issue contains an excellent article on ejection entitled "Time To Go." This article is very precise and impressive and reflects a great deal of thought behind it. There is one major flaw, however. The cover picture for the article shows a GIB ejecting out of the back seat of an F/RF-4. All aspects of this ejection are correct with two exceptions. The GIB has his sleeves rolled up and is not wearing any gloves.

If you feel it appropriate, request that the errors in the referenced article be corrected and the proper manner of attire for flight be emphasized. Since your magazine is widely read and respected by most of the aircrews throughout the Air Force, a correction of these errors would be very helpful.

Capt David R. Shaw
432 Tac Recon Wg
APO San Francisco 96237

We can't emphasize this point enough! ! Gloves and Nomex flying suits are two items you can't afford to do without. Sorry about the oversight. Guess we were impressed with the artist's ability.

* * *

"I am an instructor"

Reference the item "I Am An Instructor" which appeared on page 32 of the April issue.

I realize the reason for the item was to emphasize the need for complete, clear instructions, and maybe even a checklist; however, I certainly hope that MSgt Lewis and everyone who reads the item can now see the greatest message here. It is the fact that the 1954 Ford was being driven with a critical safety hazard. It is not difficult to visualize a fatal PMV accident caused by loss of the headlights at a critical time.

We have too many cases on record where lack of time or money was given as the reason for not correcting known safety deficiencies. Safety is directly proportional to the priority it receives from every decision level. Each of us must give our personal safety top priority as there is no second decision level.

I think you publish a good magazine and look forward to it each month.

Lt Col Joseph P. Milton
Hq 3d Air Force

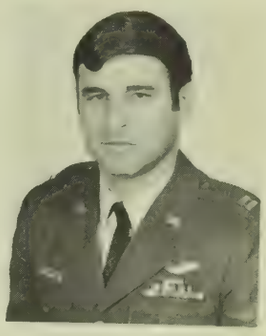
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UNITED STATES AIR FORCE

WELL DONE AWARD

Presented for outstanding airmanship and professional performance during a hazardous situation and for a significant contribution to the United States Air Force Accident Prevention Program.





MAJOR
Daniel R. DuBoise

CAPTAIN
Hoyt D. Coupland

4780 Air Defense Wing, Perrin AFB, Texas

On 22 December 1970, Major DuBoise and Captain Coupland departed Ramstein, Germany, for Naples, Italy, in a TF-101. The flight progressed normally until the aircraft was approximately 10 minutes beyond Torino, Italy, where moderate to severe turbulence was encountered. Shortly Major DuBoise noticed a small area of delamination in the left windscreen had increased in size and a crack of about one inch extended from the delaminated area. The crack was examined and it was determined that the stress panel was not cracked. The windscreen was not opaque; the delamination was in limits and the crew decided to continue the mission. Both pilots agreed to lower their visors for the remainder of the flight.

Approximately five minutes later, while the aircraft was at FL370 approximately 25 miles from the Italian coast, the entire left windscreen imploded. Fragments tore away a large portion of Major DuBoise's visor and some went completely through the metal skin at the back of the cockpit.

The aircraft was momentarily out of control and by the time both pilots recovered it had descended approximately 5000 feet and was in a 120 degree bank, 45 degrees nose low. The extreme wind noise prevented the pilots from using the intercom and, although each could see blood on the other, they were unable to determine the extent of their injuries. Major DuBoise immediately turned the SIF to Emergency, called MAYDAY, turned back toward the coast and began to descend. Since airspeed in excess of 200 knots made windblast unbearable, a slow, cold descent was required. Despite the fact that they had not been able to communicate, Major DuBoise and Captain Coupland continued to function as a team. Major DuBoise flew the aircraft while Captain Coupland retuned the TACAN. Major DuBoise continued to transmit but was unable to comprehend transmissions of Rome Control. The only readable message received throughout the remainder of the flight was the frequency of Torino Tower. As the aircraft approached Torino, Captain Coupland attempted to read the letdown plate but that plate was torn from the book by the wind, so they could not determine the location of the Torino Airport from the TACAN. The flight continued to Torino at approximately 500 feet at an airspeed of 170 to 200 knots. By the time they reached the TACAN, Major DuBoise was nearly incapacitated from the cold and the windblast to his eyes through his broken visor. At the TACAN a random search for the airport was made with negative results. Through the use of hand signals, the pilots agreed to search for the runway until fuel diminished to 1000 pounds.

Soon Captain Coupland spotted an aircraft and followed it directly over the Torino airport. Visibility at the time was one and one-half miles. Captain Coupland made a circling approach and touched down gently 1000 feet down the runway, 40 minutes after the windscreen failure. The crew was immediately taken to the airport infirmary where glass was washed from their eyes, and facial lacerations were treated.

Excellent teamwork during this emergency saved a valuable aircraft. WELL DONE!

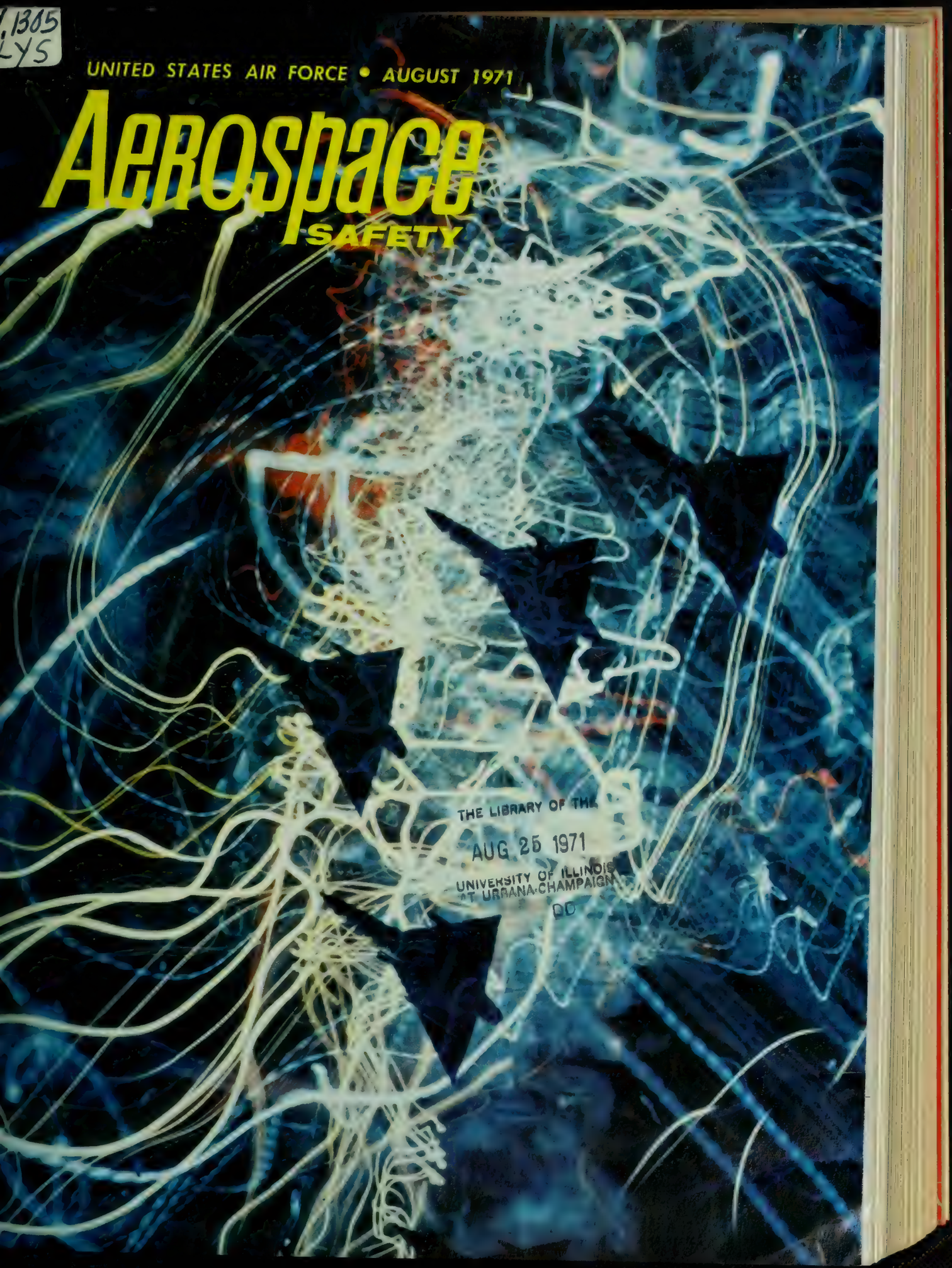


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Aerospace SAFETY



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Cover photo by SSgt Jerry A. Montrose, 1365 Photo Sq, Norton AFB, Calif. Silhouette of F-106s against background of lights of Tokyo Ginza.

UNITED STATES AIR FORCE

AUGUST 1971

Aerospace SAFETY

FOR AIRCREWS, MAINTENANCE & SUPPORT TECHNICIANS

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Inspector General, USAF

MAJ GEN EDWARD M. NICHOLS, JR.
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DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

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AUGUST 1971 AFRP 127-2 VOLUME 27 NUMBER 8



HIGH ANGLE OF ATTACK *in the* swingwing

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In the T-33, it is called "the tumble." Tony LeVier, in a December 1969 article for *TAC Attack,* called it "the thing." In aerobatics competition it is called "the Lomcevak." The F-4 experiences a "post stall gyration." Regardless of the term used to describe the maneuver, it can be a serious problem in any airplane. To operate his particular airplane safely, the pilot must understand the how and why of these characteristics.

Over the past several years, words such as post stall gyration and yaw divergence have become part of the "fighter-pilot lingo." These flight characteristics are not brand new things peculiar only to our modern aircraft, but the modern machines are easier to get into a flight region where there may be a problem. Any aircraft, at high enough angles of attack, will exhibit some sort of departure in either roll and/or yaw.

The F-111, both the bomber and the fighter versions, will "depart" if they exceed certain angles of attack. This article is written to let you know some of the whys of how you get there, what you may see if you do depart, and what you can do to give yourself the best chance of recovery. The deep stall investigations in the F-111 are still continuing at the Air Force Flight Test Center, so this is written to bring you up to date on where we are at the present time. As the tests continue, more positive data will be provided to the using commands.

HIGH ANGLE

First of all, how do you get there? If you adhere to the published Flight Manual angle of attack limits, you'll never get there. Some things, however, are peculiar to the F-111 and make these angle of attack limits easier to exceed than in some other aircraft in the inventory. One of the most important items is the shape of the lift curve.

Figure One presents approximate lift curves for both an F-111 and a T-33. Note that the T-33 curve exhibits a definite break where lift begins to decrease as angle of attack increases. In the cockpit you see this as the point at which the nose begins to fall or as a "g" break. Not so with the F-111. As angle of attack continues to increase, so does lift. This is due to the lift contributions of the wing glove and fuselage. You need to add a new term to your vocabulary at this point, and this is usable lift. Usable lift can be understood by looking at Figure One and Figure Two at the same time. As the curve for directional stability goes through zero, the airplane no longer exhibits the "desire" to fly straight ahead. This effect is caused by a number of factors, but the easiest way to visualize this is by considering that the vertical tail is blanked out by the fuselage at high angle of attack. In the case of the T-33, we saw a stall and its associated flight characteristics before we lost directional stability. In the case of the F-111 lift continues to increase beyond the point at which we lose directional stability, so prior to the aerodynamic stall, in the classical sense, the airplane will turn "sideways." Any increase in lift beyond this point is useless—thus the term usable lift.

With the F-111, the point at which directional control goes to zero is somewhere around 25 degrees angle of attack with wings level, and no aileron or rudder inputs. The exact number is not yet available, but since the aircrew is prohibited by the Flight Manual from operating in this area, it remains academic. If Flight Manual limits are used, you'll never see anything close to this figure.

CONSTANT STICK FORCE

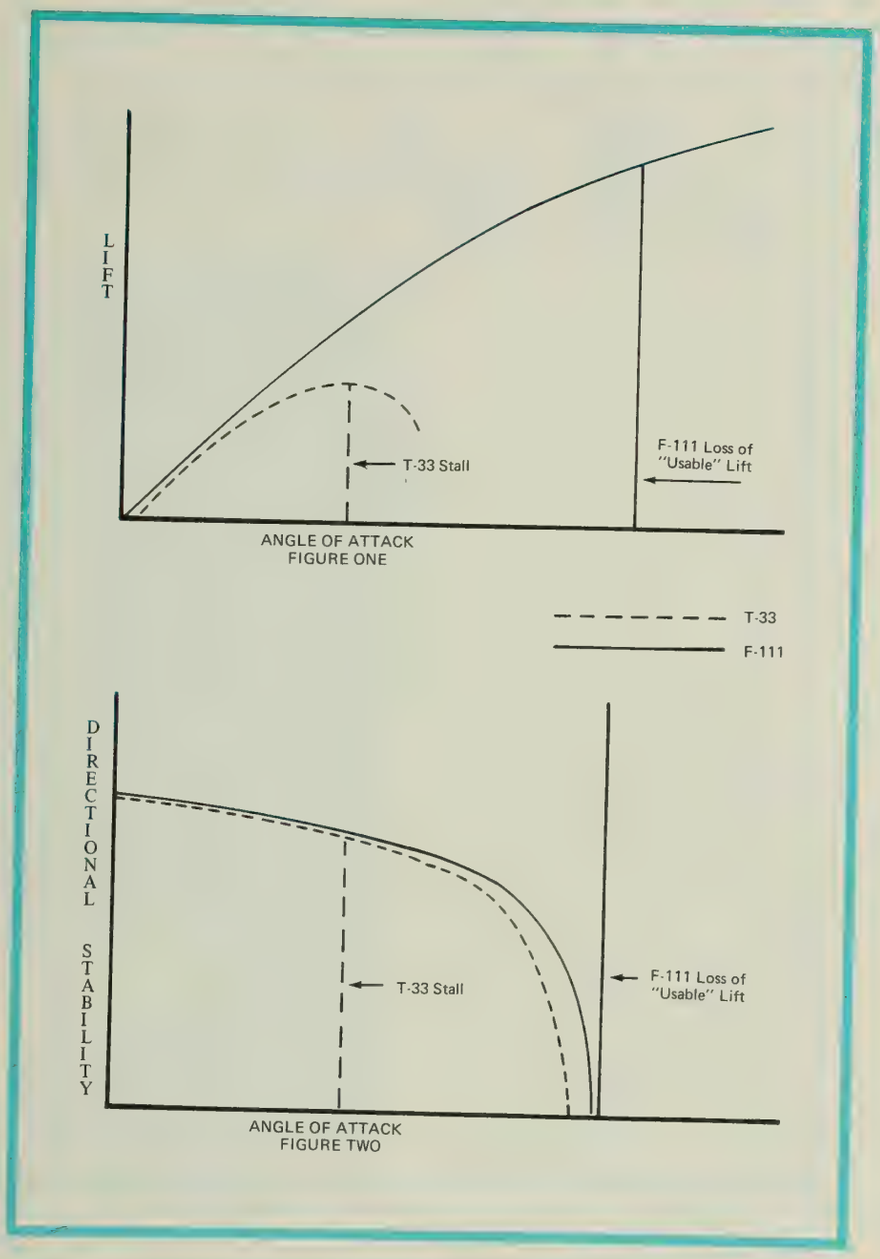
The command augmentation feature of the control system gives you two things: approximately a constant stick force per "g", and auto trim to maintain one "g" flight if the stick is neutral. How it does this is not important to this article and the details are contained in the Flight Manual. If you pull back on the stick you should get about the same number of "gs" for each pound of force applied. This happens anytime the flight control system switch is not in the takeoff and land position, or the slats extended, and is



independent of airspeed, wing sweep, or stores loading. Assume you are flying at the handbook limit angle of attack. Your induced drag is high and you are losing airspeed. If you do not push the stick forward, the same "g" load will be commanded. Since the airspeed is decreasing, "gs" will be decreasing and the flight control system will command nose up stabilator to maintain commanded "g". Nose up stabilator means increased angle of attack, and if you're not watching your angle of attack tape—you will exceed the angle of attack limits.

Another situation which also must be considered is the one in which the aircraft is stabilized at one "g." If the airspeed is decreasing, the aircraft is going to attempt to maintain one "g" flight and this means that the angle of attack will be increasing.

Due to the aerodynamic characteristics of the aircraft, and due to the design of the flight controls, the aircraft can easily be flown through the angle of attack limits. It's conceivable to imagine a pilot, who is not monitoring his flight instruments, getting into this area where he doesn't belong.



ALPHA INDICATOR

What happens if you get there? Again, this area is still being investigated, but some things can be said at this point. Buffet is usually present, even below angle of attack limits, so this is not a good cue. The intensity of the buffet is dependent on airspeed, wingsweep and "g" loading, so again buffet intensity is not a good indication. Heavy buffet should be avoided. If you encounter it, you're getting beyond where you should be. Lateral instability or wing rock is also not a good cue. As the angle of attack increases, airflow will begin separating from the wings and wing rock would start, except for the roll dampers. The roll damper is designed to correct for uncommanded roll deviations, and it does an excellent job. This same roll damper that makes the airplane fly like a Rolls Royce at high speeds on the deck is masking the initial indications of increasing angle of attack. By the time you actually perceive wing rock, your dampers will have already been deflected to their maximum authority, and things are getting serious very fast. As mentioned previously, there is no break in the lift curve, so unless you watch the alpha tape, your actual indication of stall may be when the aircraft departs.

Other than the alpha tape, the rudder pedal shaker is a positive

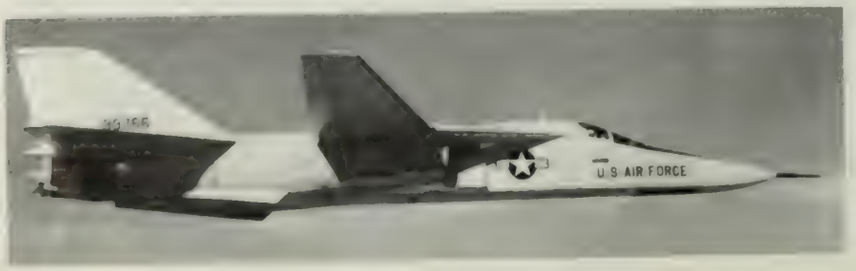
HIGH ANGLE

indication of very high angles of attack. There are some things, however, which you should keep in mind regarding this system. At wing sweeps forward of 45 degrees, in the clean configuration, rudder pedal shaker will not actuate until you're already beyond the handbook limits. Also, the rudder pedal warning will probably be masked by airframe buffet. The warning system sums both pitch rate and true angle of attack, so if you are maneuvering, you will find that it actuates below the published angle of attack limit. Including pitch rate in the warning system gives you a greater safety margin in the maneuvering environment. When you feel the rudder pedal shaker, make a positive forward stick movement to decrease angle of attack and monitor your alpha tape. Because it may be masked by buffet, don't count on the rudder pedal shaker exclusively, especially when maneuvering.

Suppose, for some reason, you discover yourself at a high angle of attack. What should you do? First of all, do not use aileron or rudder as these control inputs may induce enough yaw to contribute to a departure. If you simply release the stick the system is going to assume you want one "g" flight at that pitch attitude and respond accordingly. If you are climbing, and airspeed is decaying, you will continue to climb and angle of attack will continue to increase. The solution to the problem is nose down on the stick. Regardless of trim settings or damper positions, you always have nose down stabilator authority. Maintain this control relationship until angle of attack is below handbook limits.

DEPARTURE

What about the departure? Flight tests indicate a very smooth departure. Test pilot comments are to the effect that they really felt that the aircraft was controllable, even after departure was verified by the flight test data. This was because the departure was not violent or radical, as might be expected. All during this departure, however, angle of attack, yaw rate and roll rate are continuing to increase.

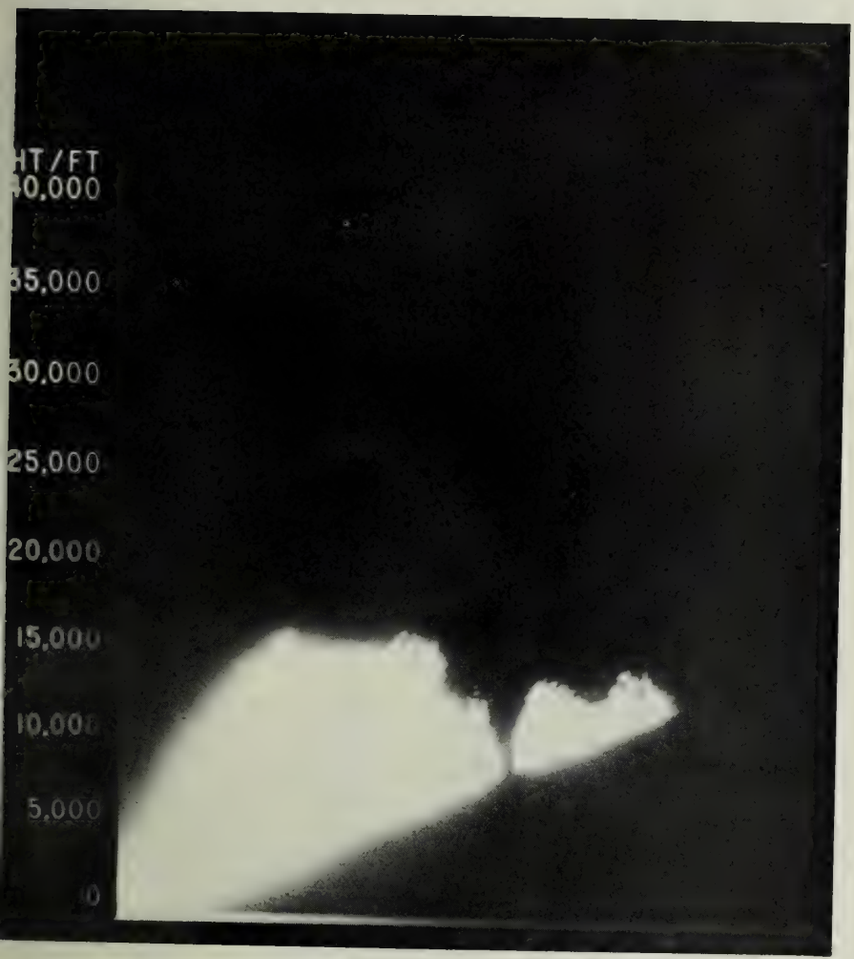


The rudder is not effective, but the stabilators are, so forward stick must be used to decrease angle of attack. If you put the stick forward, and then relax forward pressure when you note a decrease in angle of attack, you may not have solved a thing. Due to the design of the angle of attack probe, the airflow around the aircraft may cause the indicator to decrease at high angles of attack. You must maintain nose down stabilator until you get other indications that you are really flying again. This other indication is airspeed. Maintain full forward stick until airspeed is well above 200 knots and increasing. Any other control inputs during the recovery could easily result in a spin or another departure.

Prior to a departure, the damper system will attempt to oppose any aircraft disturbances in roll, pitch or yaw. After the departure, the roll damper will seriously hinder the post-stall recovery and tend to induce a spin, and it should be turned off after the stick is full forward. It should be emphasized, however, that the stick should be held full forward and no aileron or rudder inputs should be introduced while the roll damper is being turned off.

The F-111 does not exhibit previously undiscovered flight characteristics. You must, however, pay close attention to your angle of attack. If you find yourself outside of the established limits, get back to where you belong as rapidly as possible, as the situation may get worse. If the airplane departs, use the published recovery procedures immediately, and give them plenty of time to work. All indications are that the post stall gyration recovery procedures will work if you give them a chance. Finally, if you are below your minimum recommended ejection altitude, don't be a hero. ★

mini Thunder Storm



MAJ EUGENE B. BROCK, Det 28, 26th Weather Squadron, Wurtsmith AFB, Mich.

In this age of mini, midi and maxi dresses, it is well to think of thunderstorm buildups in analagous terms. Most pilots have observed the "midi" thunderstorm, with tops reaching 25-45,000 feet. In the tropics and associated with severe weather over continental land masses at mid latitudes, tops to 55 to 60,000 feet are observed (the "maxi"). But here I wish to point out the less frequently observed but important phenomenon of the "mini" thunderstorm.

Necessary ingredients for thunderstorm activity are vigorous upward motion of air, adequate liquid moisture available and upper level temperatures capable of producing ice crystal cloud tops. Due to the latter requirement, most thunderstorms are thought of as being limited to tops of at least 25,000 feet. However, in an unstable, cold air mass, thunderstorms with tops well below 20,000 feet can occur.

At Wurtsmith Air Force Base, Michigan, we recorded one of these "mini" thunderstorms on 1 May 1971. The thunderstorm, which was associated with a cold frontal passage, was observed continuously by the writer through the use of the AN/FPS-77 Weather Radar. The accompanying photograph is a vertical cross-section taken along an azimuth of 150 degrees True and covering a distance of 30 nautical miles from left to right (with Wurtsmith at the lower left corner). The thunderstorm, the nearer of the two echoes shown, was 11 nautical miles SSE of Wurtsmith, with a diameter of eight miles. The radar top of the thunderstorm is shown to be 16,000 feet. The temperature at that altitude was approximately $-23^{\circ}C$ ($-10^{\circ}F$), sufficiently cold to produce the ice crystal top characteristic of thunderstorms.

Pilots are always warned to expect severe turbulence, severe icing and hail with all thunderstorms. We heard thunder, saw lightning and experienced a rain shower with this thunderstorm. There were unofficial reports of one-fourth to one-half inch diameter hail occurring at a golf course a few miles south of the base, in the vicinity of the radar return.

MORAL OF THE STORY: AVOID FLYING THROUGH TOWERING CUMULUS CLOUDS WHERE POSSIBLE. THEY'RE BUMPY AT BEST AND COULD BE HAIL LADEN "MINI" THUNDERSTORMS IF THE OUTSIDE AIR TEMP IS COLD ENOUGH. ★

The trip



MAJ DAVID H. HOOK
Canadian Forces
Directorate of Aerospace Safety

"Come into my office for a moment, please, Burlap."

"Sure, Boss." Swallowing with just a hint of nervousness, First Lieutenant Zachary Burlap, Jr., USAF, followed his flight commander across the crew room.

"Hooo, boy! What now?" he muttered to himself. "Don't tell me the old scoundrel found out about that - - -. Naw, news doesn't travel that fast. Maybe, he's gonna mention that blown tire again. Hey, I know! He wants to thank me for getting the bird back in time for Charlie's cross-country this morning." With this cheering thought, Burlap mentally reviewed some modest replies that would be suitable for the occasion.

"Have a seat, Zack," said the major, "and tell me about your weekend trip."

"Well, Boss, it was great! I met this swingin' chick in a quiet little place just outside the Centerville gate, and you wouldn't believe - - -." The upraised hand of his fearless leader cut the story off just as Zack was waxing enthusiastic. "Zack, that's not quite what I had in mind. Were your flights unusual in any way?"

"Heck no, boss. Why the flight to Centerville was VFR all the way. I had to dodge a few CBs at altitude, but the arrival was no sweat. There was a bit of weather coming back in here, but I wasn't worried because I know this field like the back of my hand. Why I even got the bird back on the line in time for its scheduled trip today. I didn't notice anything unusual, why?"

Zack thought he heard the major sigh. "You don't happen to remember what the weather was last night, do you, Zack?" the major inquired benignly.

"Well, the reported weather was kinda tough, if that's what you mean," said Zack, "but the viz looked pretty good when I broke out at minimums. I'd say that it was not less than half a mile."

"Half a mile," mused the major as he glanced down at his desk. "This weather report states that the RVR was 20 at the time you landed. You don't happen to recall what squadron orders say about minimum weather approaches, do you?"

"Pilots with 500 or more hours total FP/IP time are authorized to make weather approaches to field minima," quoted Zack. "And - - - -."

"That's a close-enough interpretation," the major interjected. "Let's see, you have about 540 hours FP time, right?"

"Right, sir."

"OK," said the major, his jaw tightening perceptibly. "You've got a whole lot of experience in the past year or so. So I'm willing to accept your judgment that the forward viz from your cockpit was a half-mile. However, there's another small matter that I'd like to discuss.

"Sergeant Croochief advised the Ops officer this morning that your aircraft's fuel tanks were almost empty when you landed. He estimates that your usable fuel amounted to about 300 pounds. Any comments?"

Zack's mind flashed over the dozen or so "reasonable" excuses for returning last evening that his subconscious had dredged up overnight, and he was tempted to try a couple of the better ones. Short-of-cash, Out-of-fresh-clothes, and Bumped-out-of-the-VOQ were quickly rejected as lacking in force and originality. He even toyed with

using the Sick-kids-at-home routine, but he figured the flight commander would remember that Zack was single. So in the end, Zack decided to tell the truth—well, most of it anyway.

"I checked out of the Q around nine AM yesterday, and went down to base ops. The weather here was down to zero, but I didn't have much money and I had nowhere else to go anyway, so I hung around ops waiting for the weather to break.

"Around noon the forecaster said that he thought the weather here would lift at four o'clock, so I went ahead and planned the trip to take off about three. At two o'clock I got a formal briefing for the 175-1, and the forecast for here at my ETA at 1640 was prevailing two hundred overcast and one-half mile, intermittently one hundred and a quarter. Light rime icing was forecast for the approach. The alternate was supposed to go no lower than five hundred and two.

"I've busted that kind of ceiling dozens of times here, so I wasn't the least bit hesitant in flying. When I arrived at the aircraft at twenty-to-three, the Transient Alert people were changing a tire. (They'd found a cut on the preflight). They were short staffed, and they had to interrupt their work a couple of times to park transients. The aircraft was finally placed in commission at 1530, and as I was only a half-hour behind my proposed departure, I decided to get a clearance and go.

"The clearance came in right away, so I cranked up and arrived at the runway around 1540. I had to wait for radar release, but I finally got airborne at 1545.

"EVERYTHING PROGRESSED smoothly enroute, except that the headwinds were stronger than forecast, and I was using more fuel than I'd planned. A half-hour from home I checked the weather with Metro, and the duty forecaster confirmed the weather was two hundred and a half, and my alternate was down to five hundred and two. There still wasn't any sweat, so I pressed on, arriving at the initial fix with about 30 minutes fuel—enough for a looksee here, then a hop into the alternate.

"Unfortunately, that's when the runway at the alternate closed temporarily and the weather here was confirmed at one hundred and a quarter, RVR 20. I didn't have anywhere else to go, so I started down for the ILS.



"I don't know what happened exactly on the first approach, but apparently the visibility wasn't too bad. I had the ground in sight at least a mile and a half from the runway, so I transitioned to a contact approach. Funny thing though, I saw all kinds of lights from streets and houses, but I never saw the approach lights, and I didn't see the runway until it slid by under the left wingtip.

"I knew that a landing from that position would have been extremely risky (Might as well show a little humility, thought Zack) so I made a go-around and called for a missed approach. Approach control wanted me to climb up and hold, but as my fuel was down to 12 minutes or so, I declared an emergency and requested another ILS.

"AFTER THEY CLEARED an airliner out of my way, I made the smoothest low altitude procedure you ever saw. This time I stayed right on the dials past the middle marker down to decision height, looked up, saw the approach lights and landed no sweat. Why, the whole procedure only took about eight minutes, and I had plenty of kerosene left to taxi back to the ramp."

To Zack's surprise, the major's face softened slightly into a wry, tight little smile as the room fell silent. When it came at last, the major's voice sounded as though its owner were at the bottom of a deep well. "Zack," the voice echoed resonantly, "there seems to be some hope for you yet. For a second or so, I thought you were going to foul up the end of your story by making some kind of nutty comment about how great and skillful an aviator you are. Your restraint is commendable; however, there are a few other matters that demand our further attention. You were that far (the major held his thumb and forefinger a la Maxwell Smart) from busting your rear end and my airplane!"

"Yes Sir," admitted Zack, even to himself.

"Awright," said the major. "Let's see where this trip went wrong. First of all, have you any ideas as to why you missed the first ILS approach?"

"It wasn't the TACAN/ILS switch or the receivers," said Zack, "because both flags were out of the way, the audio signal was strong, and I had the correct course set in. When I first saw the ground, both the glide path and the localizer needles were within one dot width of center. I don't know why I missed the approach."

"This weather report might provide you with a clue, Zack. You

The trip

were given a surface wind of 60 degrees off your tail at 10 to 15 miles per hour. I checked the wind at 2000 feet, and it was right on your tail at 20 during both your approaches."

Zack's face lit up. "Got it! The old windshear trick!" And as soon as he said that, his face fell. "Hooo boy, and while I was looking out the window trying to fly VFR, I drifted off the localizer."

"Right," said the major. "Let's assume that you were on the localizer at a mile-and-a-half from the threshold and that your crosswind component suddenly increased by ten knots, or say 15 feet per second, and you didn't alter your heading. At a ground speed of 180 knots it would take you 20 seconds to reach the outer approach lights. In that time you could drift 300 feet or more off the centerline."

"Yah, but I still shoulda seen the approach lights," said Zack.

"Where were you looking for them?"

"Out the front window," came the forlorn reply.

"NEXT TOPIC!" the major announced in a gravelly tone. "I was just talking with the chief FAA controller, and he advises me that I can expect to receive a copy of a violation report on you. Perhaps you can guess what for?"

Zack, who was still mulling over the windshear problem, allowed as how he hadn't the foggiest notion.

"What is your clearance limit when you're cleared for an instrument approach?"

(Boy, this guy asks some dumb questions.) "To the field, of course," said Zack.

"Nope."

"Nope?"

"Nope! Your clearance is not only to the field but to the depicted missed approach limit. When you went around, you not only violated your clearance limit by turning back to the outer marker, you endangered the lives of everyone on that airliner. What's more, you maneuvered on the wrong side of the field as if you were flying a closed pattern. If you tried a trick like that at a strange base in hilly terrain, you'd probably hit the ground."

Zack thought he had a good reply to this one. "Well, Chief, I know this area by heart, so I knew I wasn't going to hit anything. Besides, I was so low on gas, I had to turn right away."

"That brings up a new point, Burlap. With what fuel loads are you required to declare minimum and emergency fuel?"

"Ahhh, 1500 and 1000 pounds, Boss."

There was silence. The major's stony expression seemed to demand further comment from Zack.

"Ahhh, well, you know, I was, ahh, going to declare minimum fuel at the initial fix, you know, and, ahhh . . ." Zack's voice trailed off.

"No, I *don't* know. Do you?"

"No," said a squeaky voice that Zack barely recognized as his own.

"If you had declared minimum fuel *and* if there really was no other place to go, approach control would likely have held the airliner well out of your way until you landed or ejected. At least they would have been able to offer you vectors back to the marker in a race track pattern for a low-fuel procedure. Your declaration of low fuel caught them by surprise, so they decided to let you flail around in your own pattern, as you *seemed* to know what you were doing. The controller pointed out, however, that he thinks he might have shortened your pattern by as much as two minutes by bringing you over the outer marker on an inbound heading. Your teardrop procedure wasted time and fuel."

Zack pondered that thought for a moment, then nodded his head in dumb agreement. The vague uneasiness which had gripped him earlier was giving way to a mild, but definitive, panic.

"OK, Burlap, now we come to the nitty-gee," quoted the major, his voice rising. "Why did you wind up in such a predicament in the first place? You knew midway through your flight that you would be skosh on fuel and the weather wasn't all that good—with no sign of getting better. Why push your luck and try to stretch it in here? Surely, you're not going to tell me that you wanted to get the bird back for good ol' Charlie?"

Zack's mouth had been popping open and closed as he tried to insert an answer after each question, but since he *was* going to claim his utter dedication to getting the bird back to Charlie, he was left without an answer; his jaw just sagged open as though he had a bad case of adenoids.

"What was the *real* reason, Zack?" said the major very quietly.

"I, uhh, had a, you know, - - - a date."



"A date," repeated the flight commander in a flat tone. His face showed neither triumph nor satisfaction at the admission, just a look of sad resignation. "You'd risk your neck, busting bad weather with low

fuel just for a date? Zack, Zack! Where did I go wrong? Haven't I always told you that your first priority must be to preserve the health and well-being of Number One? Sure, we have to be able to fly to field minima on operations, and we do it frequently when we're caught airborne and the weather moves in. However, we also try to get ourselves on final approach with a comfortable fuel reserve and a good alternate in our hip pocket. As far as I'm concerned, you blew it when you didn't make a diversion after you noticed the fuel state falling behind on the Form 70. You did keep a flight log, didn't you?"

"WELL, I MADE ONE OUT, CHIEF, but you know how those things never work out, especially when ATC keeps you on the ground. I - - - -."

"Never mind, Burlap. Do you recall your planned fuel reserve, in minutes, for the initial fix?"

"It was about 50 to 55 minutes at max endurance."

"And you arrived with how much?"

"About half-an-hour's."

"How much?"

"Twenty-five minutes."

"Enough," declared the major, "for a penetration, two missed approaches and an ejection!"

"Yessir."

"Burlap, you had GETHOMEITIS, a most insidious disease that afflicts all of us at one time or another. Its most common symptom is abominable judgment (or should I say abdominal?) based on an uncontrollable desire to get home regardless of the obstacles. If not treated at the first outbreak, the disease is often fatal. You with me, son?"

"Yessir."

"Now that you've survived your first, and hopefully last, bout with gethomeitis, you should know about a few other guys who weren't so lucky.

"Two F-4s were out on a cross-country and they'd had to RON two nights because the weather at home was bad. When it finally lifted at home, they elected to take off in formation even though the weather was below two hundred and a half. Number two didn't even have a chance to make some of your mistakes. He crashed shortly after takeoff.

"Another crew was also delayed two days at an intermediate base because of poor weather along the route and at home. A forecast of isolated thunderstorms, moderate turbulence and light rime icing didn't faze this crew, and they launched for home in their small utility aircraft. The pilot had about as much experience as you, but he crashed a half-hour after takeoff, taking two other people with him.

"The last one was the saddest of all. Five people were lost when a transport crashed on the third ILS attempt in one hundred and three-quarter weather, with light rain and fog and a crosswind component of 16 miles per hour. The visibility averaged 26 RVR but dipped as low as three-sixteenths of a mile. They had enough fuel to go somewhere else, and they should have had the same amount of sense.

"Altogether, ten lives were lost to gethomeitis in three accidents where there was no mission requirement to return to home base. You," said the major, stabbing his index finger toward Zack, "could have been the eleventh."

Zack fidgeted nervously and with obvious embarrassment. "Look, sir, I've got no excuses. Until you described it, I just didn't realize what a serious fix I was in. I'll admit that I was sweating a lot on that second approach, but I guess I was never too concerned. I know now what they mean by overconfidence. You can bet I won't get into another corner like that again!"

"Burlap, it's very tempting to make sure you don't get into a corner by taking you off status. In fact, the Colonel and I just finished a discussion on that subject. However," the major continued, "you're not a bad pilot, and there seems to be a trace of some socially redeeming value in your attitude now, that wasn't there ten minutes ago. If you learn from these mistakes *and* from the experience of others, you just might survive your youth after all."



"In any case, you are now working on your second, and last, chance. Instead of using poisoned darts, I'm only going to nail your hide to my office wall with small tacks. First, you're going to be the special subject of the attention of our friendly flight examiner for a week or so. He is going to try to repair any other flaws in your aeronautical education. What happens after that depends entirely on you. The Colonel will administer the violation when it arrives. Any questions?"

"No, sir."

"Get outta here."

As the door closed behind a grateful Zack, the major's expression changed slowly to a wry grin as he reflected on his own close calls of earlier years. "They may be bigger, but today's kids are just as dumb as we were!" he muttered to himself. ★

THE I.P.I.S. APPROACH

By the USAF Instrument Pilot Instructor School, (ATC) Randolph AFB, Texas

CIRCLING APPROACHES

Correction: IPIS Approach, July 1971. Item 3 under "Keep 'em High" should read 10,000 feet instead of 20.000 feet.

The following discussion is intended as a general review of circling approach procedures and techniques. It is impossible to cover every conceivable situation that may occur. The fact that a circling approach is a visual flight maneuver often conducted in weather conditions below VFR minimums makes it worthy of increased attention here and in instrument training sessions. Pilot judgment is the most critical element in the successful accomplishment of a circling approach.

Q I am flying an approach to Runway 23 which has a circling MDA of 940 feet. I intend to circle to Runway 36 which has a circling MDA of 1020 feet. Which MDA do I use?

A 940. The IFR Supplement states, "The circling MDA and weather minima to be used are those for the runway to which the final approach is flown—*NOT* the landing runway." The words "final approach" refer to the *instrument* final approach. The reasons for having differing circling MDAs for different runways were discussed in the April 1969 issue of this magazine.

Q Upon reaching MDA, which direction should I circle to land?

A AFM 60-16, para 5-7c, requires aircraft approaching to land at an airfield with an operational control tower to circle to the left unless otherwise directed. This will be further clarified in the forthcoming AFM 51-37 as follows: "The pilot is expected to circle to the left, i.e., make a left turn to final approach, unless:

"1. He requests and receives permission to do otherwise; or

"2. He is directed by the controlling agency to do otherwise; or

"3. He is required to do otherwise by restrictions on the approach chart."

The path flown to arrive at a base leg position is normally up to the pilot. However, every situation is different. Any misunderstanding between the pilot and the controlling agency, normally the tower, must be clarified before performing the circling maneuver.

Q When may I descend below circling MDA?

A You may descend below MDA when you have visual reference with the runway environment and when you are in a position to execute a normal landing.

Q What should I do if I am unable to maintain visual flight at my circling MDA?

A You cannot descend below MDA unless you meet the criteria established above. If you cannot maintain visual flight conditions, you must execute the missed approach. Make an initial climbing turn toward the landing runway and continue the turn until established on the missed approach course. If radar is available, conform to vectors when provided by ATC.

Q What obstruction clearance is provided at circling MDA?

A A 300 feet obstruction clearance is added to the height of the controlling obstacle and the sum then rounded off to the nearest 20 foot increment.

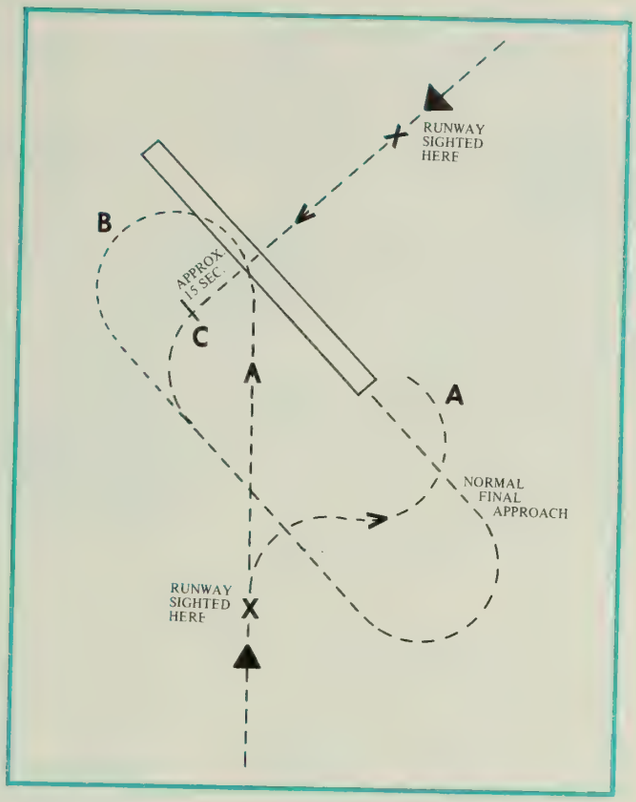
Q What techniques would you recommend to help the pilot plan and fly a circling approach?

A It is difficult to provide guidelines that will apply to all aircraft in all situations. The most common problem associated with a circling approach is overshooting the final approach course. Contributing causes are: (1) visual deception in that the aircraft is considerably lower than a normal VFR pattern which makes range estimation difficult; and (2) pilot proficiency in that we fly circling approaches so seldom either "for real" or for practice. With these factors in mind, we recommend the following:

1. Allow adequate airspace to maneuver to final approach. Taking the shortest route to the runway often results in either an overshoot of final approach or a continuous descending turn to touchdown, both of which are undesirable. This is shown in Example "A."

2. DON'T RUSH THE MANEUVER! Take the time you need to safely maneuver the aircraft to a normal final approach. If this means flying to the center of the airfield, making a shallow turn to downwind, and establishing a one-mile final approach, then do so. This is shown in Example "B."

3. If you must overfly the runway on a nearly perpendicular heading, DO NOT start your turn to downwind immediately over the runway. You will have the necessary lateral spacing if you delay this turn approximately 15 seconds after passing the runway. This is illustrated in Example "C."



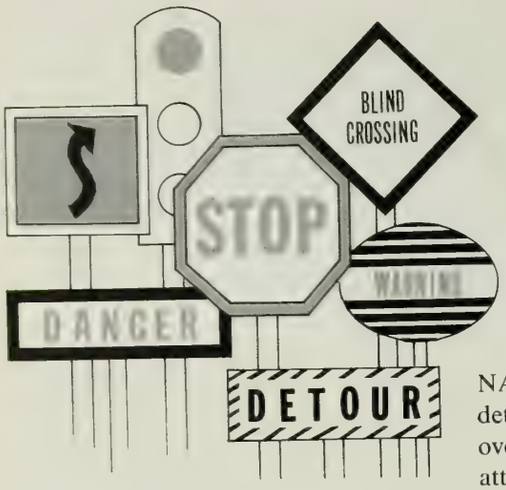
4. Know your capabilities and your aircraft. Don't hesitate to go-around and try it again if your first approach is not satisfactory. Don't succumb to "target fixation" watching the intended landing point. Cross-check all available instrument and visual references.

5. Circling MDA is a *minimum* altitude. Only the weather conditions will preclude circling at a higher altitude.

6. Don't turn down the opportunity to practice a circling approach! How often do you terminate your flight with a precision, straight-in, full-stop?

POINTS TO PONDER

The USAF IPIS claims NO corner on the "good idea market." If you have a technique, personal preference, or different approach to some area of instrument flight that you feel could benefit other pilots, please feel free to drop a note to: USAF IPIS/FTYI, Randolph AFB, TX 78148. We hope to make this monthly article more than a one-way flow of information. For example, many of the techniques discussed in this article were recommended to us by a MAC troop at Charleston. ★



TEN DANGER SIGNS

OF A HEARING LOSS

Courtesy of MAICO Hearing Instruments

Loss of hearing may make an individual a hazard to himself and others. The Air Force has a well defined and effective hearing conservation program; nevertheless, individuals can aid in early detection of hearing loss. The following is presented with permission of MAICO, a leading manufacturer of hearing instruments.

There are numerous symptoms which can serve as warnings of an impending hearing loss. The individual who is losing his hearing may not realize it himself, but his personality is changing gradually. Often his family and friends will notice these personality changes very early, hence suspect a hearing loss even before the affected individual has any idea of what is happening.

Taken individually, these symptoms may not indicate loss of hearing . . . they may be caused by something entirely apart from hearing loss. However, where several of these symptoms are found and where they seem to become progressively worse, it is generally wise to consult a doctor for a hearing checkup!

You can check yourself or—better yet—have a member of your family evaluate your hearing on the basis of these TEN DANGER SIGNALS. A hearing problem, when detected early, can almost always be overcome satisfactorily by medical attention or a properly fitted hearing aid, so you can see how important an early evaluation can be. These are the symptoms to watch for:

• **SPEECH DETERIORATION.** If a person slurs his words or drops word endings, if speech is "flat" sounding, he may not be hearing correctly. The ears guide the voice, both in loudness and pronunciation. If someone complains that he has difficulty communicating, he should have his hearing tested!

• **FATIGUE.** If he tires easily when listening to conversation or to a speech, it may be the result of straining to hear. Under these circumstances, he may become irritable or "touchy" very easily.

• **INDIFFERENCE.** It is easy for a person to become depressed and disinterested in life in general when he can't hear what others are saying. This is a perfectly natural reaction.

• **SOCIAL WITHDRAWAL.** Not being able to hear what is going on around him causes the hard of hearing person to withdraw from situations which might prove embarrassing.

• **INSECURITY.** Lack of self-confidence and fear of mistakes creates a feeling of insecurity in many hard of hearing persons. No one likes to "say the wrong thing" or do something that might tend to make him look foolish. Often these people are also worried about the possible loss of their jobs because of their hearing problems!

• **INDECISION — PROCRASTINATION.** Loss of self confidence makes it increasingly difficult for hard of hearing persons to make decisions. They are apt to "drift along" with the situation rather than face important decisions which they would have found easy to make previously.

• **SUSPICIOUSNESS.** Because he often hears only a part of what is said, the hard of hearing person may suspect that others are talking about him or that portions of the conversation relating to him are deliberately spoken softly so that he will not hear them!

• **FALSE PRIDE.** The hard of hearing individual wants to conceal his deafness. Consequently, he often pretends he is hearing when he actually isn't . . . and even when all his friends and associates *know* he isn't.

• **LONELINESS AND UNHAPPINESS.** Though everyone wishes for quiet now and then, *enforced* silence can be boring and even somewhat frightening. Persons with a hearing loss often feel "left out of things." Since many of them are older, they may have fewer friends and less opportunity for contact with others. They are often inclined to feel sorry for themselves, misunderstood or neglected.

• **TENDENCY TO "HOG" THE CONVERSATION.** Many hard of hearing people tend to dominate the conversation, knowing that so long as it is centered on them and they can control it they are not so likely to be embarrassed by some mistake. ★

PRIMED FOR AN ACCIDENT . . .



During liftoff for a training mission the fighter's right wing folded. Full left aileron and rudder failed to correct the right roll condition. The aircraft touched down to the right of the runway and slid to a halt. The crew escaped with minor burns but the aircraft was destroyed by fire.

Cause: The crew chief failed to assure that the right wingfold mechanism was locked during preflight inspection, and the pilot missed it on the external inspection.



The F-106 came to rest 2100 feet from touchdown after all attempts failed to lower the right main gear.

The accident was classed as major. The cause—maintenance. The crew chief had improperly installed the gear safety pin bag which resulted in binding and failure of the right main gear door forward actuator cylinder eyebolt assembly.



A support type aircraft made a forced landing in a field when both engines quit after four hours of flight. The crew and passengers escaped without injuries.

Maintenance error. The fuel quantity indicating system was incorrectly calibrated. The indicators indicated 1175 pounds remaining when the engine failed due to fuel starvation.

In each of the above accidents, maintenance had failed to properly do the job. Errors in aircraft maintenance are almost always costly, as was proven by each of these accidents. Regardless of the job, whether a major overhaul or an alert launch, it must be done correctly. Don't make an aircrew or passengers pay for your mistakes. ★

. . . SHORT

In a summary of its 1970 aircraft accidents a major command stated that ". . . landing is the most likely time when pilot factor accidents will occur."

Historically, the landing has been the most hazardous phase of flight. In February of last year in an article titled "Landing Short," *Aerospace Safety* reported on a five year history of aircraft accidents involving short landings. The picture wasn't very good. To recap briefly, there were 18 in 1965, 32 in '66, 11 in '67, 25 in '68 and 16 for the first nine months of 1969. This would indicate that we could have expected something in the neighborhood of 20 for 1970.

But it didn't turn out that way. In addition to having the best accident record in Air Force history, we also must have set some sort of record for avoiding short landings. There were only six major accidents in this phase in 1970, three minors and 10 incidents. Obviously we were doing something right.

We in the safety magazine business modestly disclaim any credit for this; however, we can't help but feel a tiny glow of satisfaction, because we hit the subject hard in a number of articles during 1970.

Although the number of landing short accidents last year was way down, the cause factors remained the same. Of the total 19 accidents and incidents, 15 were laid on the pilot, IPs bought two (supervisory) and one was charged to maintenance. Of the six majors, five were pilot factor.

In the analysis we did last year we pointed out that, while pilot factor predominates in short landings, pilots get a lot of help from other things such as facilities and weather. Lack of overruns or soft dirt overruns, construction in progress, marginal or no lighting, lack of landing aids have contributed significantly. Weather has been a contributing factor in the form of poor visibility, turbulence, wind and wind shear, rain and downdrafts. Weather never appears as a primary cause, but it has been a frequent contributor in that it aggravates the pilot's problems during landing.

Now let's take a look at those six majors last year. One was a classic case of an IP not taking over in time and allowing a student to stall and land short. Maintenance was primary in one, in which complete electrical power was lost and the pilot couldn't quite make it to the runway.

The other four—all fighters—were pure pilot factor. One landed in the overrun at night and hit some unlighted obstructions on a construction job. Another pilot saw too late that he had a higher than normal sink rate, attempted to fly up to the runway with full mil power but hit a light stanchion 1400 feet short.

Then there was one in which Lead made a normal landing but

. . . LANDING!



Nr 2 touched down in the overrun and his stowed tailhook caught the BAK-12 cable. The hook and lower tail assembly were pulled off and the nose gear collapsed.

The last one was one of those things that leaves you wondering. The engine quit in the pattern so the pilot attempted a flameout landing. He was too high so he slipped to lose altitude, lost control and crashed.

When we compare 1970 with the previous five year history one interesting thing pops up: In 1970 there were no major accidents and only three minors involving transport aircraft. Our crystal ball is a little cloudy, so we can't tell you why, considering that during the previous five years there were something like 35-40 involving transports. However, there is an indicator. After an article in *Aerospace Safety* last year offering blueprints of a simple approach aid called the Poor Man's VASI we have received approximately 40 requests, all of which have been filled. Whether this device is being installed and used we don't know, but the number of requests indicates that someone has certainly been thinking about the landing problem.

Evidently someone has also been doing something about it. And that's the way we prevent accidents. Keep up the good work. ★

(A good reference for those who haven't seen it is the film "Landing Illusions—Short Landings," TF-6140, 1969, 10 minutes, color. ED.)

THE AERO CLUB TODAY



SQUADRON LEADER DONALD MELVIN (RAAF)/CAPT TERRY A. NEL
Directorate of Aerospace Safety

Calendar year 1970 was the best year yet for Air Force aero clubs. We finished the year with 73 clubs in operation, serving a total of 10,550 members; we amassed more than 280,000 hours of flying (a record high) while achieving an accident rate of 8.2 per 100,000 hours (a record low). Comparing these statistics with those of general aviation as a whole, the aero clubs come off very well, indeed. In the same year, general aviation experienced an accident rate of 14.5.

The first quarter of 1971 looked even better. Membership climbed to 11,295, flying time rose to more than 61,000 hours (a record for first quarter, with winter weather problems) and the accident rate plummeted to 3.3 per 100,000 hours!

Now that we've cleverly patted ourselves on the back without even putting a shoulder out of joint, let's consider some of the less positive points.

• Any accidents at all are excessive.

• We come off well compared to general aviation, but, with the possible exception of first-year cropdusters and egrets who nest by jet airports, general aviation has the worst record around. Favorable comparison with general aviation is faint praise.

• Aero clubs have access to the largest supply of professional pilot expertise in the world, and should be able to offer their members the ultimate in flying safety. Alas, this is not always the case.

During the second quarter of 1971 the bottom fell out. In a short period of time two disastrous accidents resulted in the senseless loss of six lives and the destruction of two aircraft, prompting the Chief of Staff to order a no-notice inspection of a representative sele tion of aero clubs by inspection teams of the USAF Inspector General.

The results were disappointing. Despite the steadily improving accident picture and despite the favorable comparison with general aviation, we still have a long way to go. Some salient points culled from the inspection teams' findings serve to illustrate:

• **Most accidents occurred in the landing phase,** as expected; but investigation pointed clearly to case after case in which there was either a lack of proficiency on the part of students cleared solo, or insufficient supervision to ensure that proficiency was maintained. At six of the seven clubs inspected, instructor standardization, procedures and proficiency were markedly deficient: IPs were overdue annual checks; IPs were not using a standardized training curriculum (at some clubs a standard curriculum did not even exist); some IP checks were superficial—30 minutes in one case, 45 in another; one club had one instructor for 50 students; another club had 18 part-time instructors for 75 students, an impossible situation for instructor proficiency. Instructors were involved in both of the midair collisions in 1970, and an instructor and his student were killed when the IP commenced a

demonstration of stalls and slow flight only 800 feet above the terrain. Supervision of instructor pilots is an area requiring much attention.

• **Aircraft security was weak in most clubs.** Are your club's aircraft protected against unauthorized flight? Could an aircraft be stolen and crashed on the airfield during an attempted takeoff in the middle of the night? Could two teenagers forge a flight plan, get it approved, "borrow" an airplane and leave the country in it before crashing? Both these instances happened last year!

• **Many maintenance discrepancies were found.** Some inspections were not accomplished at all; others were improperly documented, making it impossible to determine when the next inspection was due. Many aircraft discrepancies were not documented, and many more remained uncorrected weeks after documentation. Spare parts were found stored in dirty and contaminated environments and stacked carelessly without protection. Some maintenance gear was stored outside, exposed to the elements, and it was impossible to determine the serviceability status of many items.

• **Management at most clubs needed improvement,** especially in the area of compliance with directives. The teams found many discrepancies and shortcomings in AFM 215-4 and AFR 215-2, and action has been initiated to correct this. Some Boards of Governors, however, were not following their own constitutions!

• **Safety surveys were not being conducted** at six-month intervals as required. When surveys were conducted, they were superficial and often did not identify significant problem areas. Some surveys, once completed, were not reviewed by



the base commander. At one base the club safety officer had attended only five safety meetings in 18 months.

• **Many unsafe practices were either condoned** or ignored. Flight manuals, checklists and flight planning documents were outdated. One base had two different checklists for the same aircraft.

Club flyers were at fault in 23 of 28 accidents since the beginning of 1970; instructors were involved in four; and materiel failure was charged for one. Specifically, aero club flyers:

• Hit a telephone pole during a practice forced landing, after being briefed to fly a minimum altitude of 500 feet AGL.

• Landed in a water-filled drainage ditch near the airfield, thinking it was a wet runway.

• Crashed after takeoff because improper pilot checks did not detect a carburetor heat malfunction.

• Became lost and low on fuel during a cross-country flight, even though the aircraft was equipped with adequate VHF navigation aids. The aircraft was wrecked during an attempted emergency landing in a field.

• On two occasions attempted flight in adverse weather, resulting in a total loss of six lives.

• Damaged numerous aircraft either in the landing phase or on rollout.

Who's responsible? Let's take a look . . .

One of the general findings of the inspection teams was that the quality of a club is directly proportional to the interest of the commander. If the commander takes a "fend for yourself" attitude, there's little doubt which direction the club will go. Aero clubs are, and should be, very low on the operational priority list; nonetheless, USAF considers them a vital part of recreational services, and there's much that can be done to help them at very little cost. Merely knowing that the commander's attitude toward the club is benign opens a great many doors.

The largest measure of responsibility for a club's operation falls in the lap of the membership. After all, it was club members who accepted aircraft with uncorrected deficiencies, disregarded checklists, tolerated dirty and lax maintenance procedures, accepted non-current flight planning publications, flew an aircraft with a dirty glass jar of oil rolling around loose in the baggage compartment and failed to insist on more active participation by the clubs' safety officers. In a typical club, a very small percentage of the membership takes the whole burden of club operation on their shoulders —the remainder free-load.

In summary, the efficient operation of an aero club is the responsibility of everyone connected with it, from the commander down to the newest member. Aero clubs will be a special interest item for no-notice inspection teams in the future, but this should not be the impetus for club improvement. The club belongs to the commander and the members —if each contributes, it will be a good and safe club. ★

watch those dents

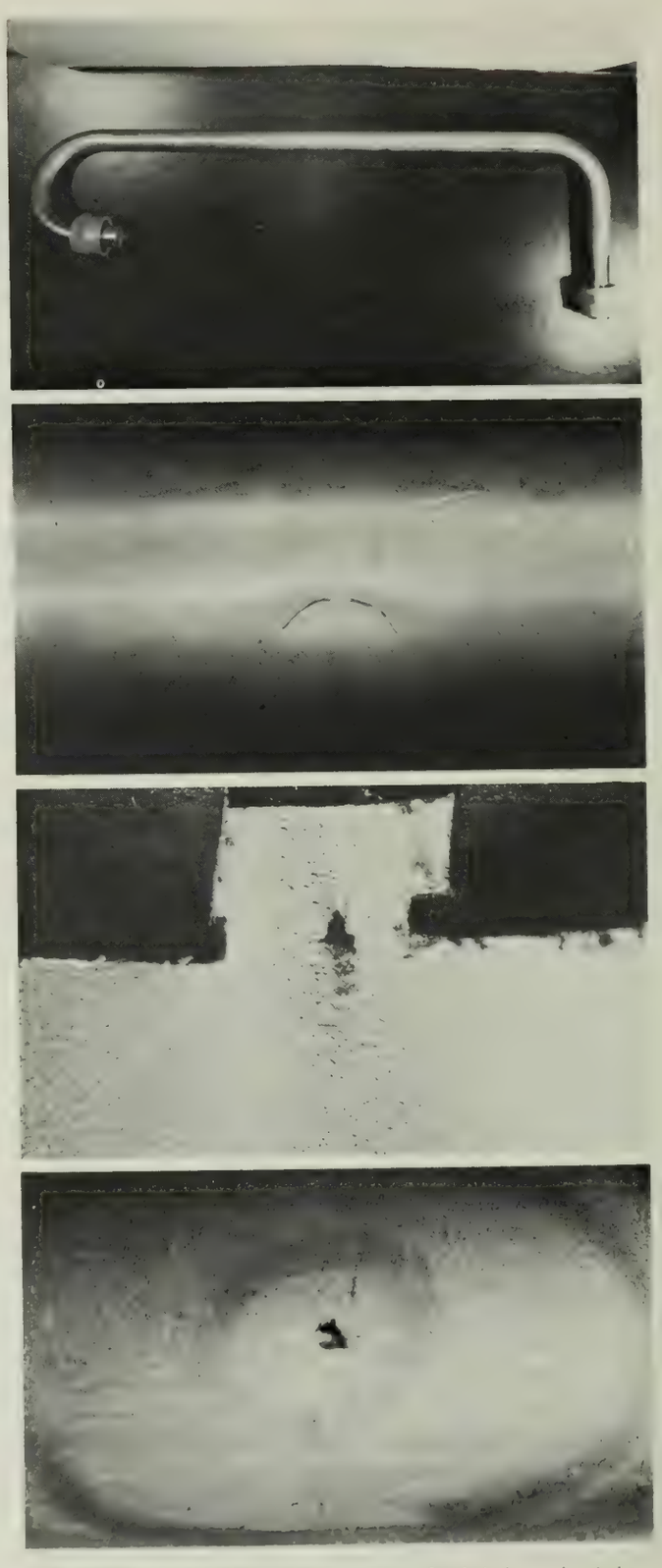
HARVIE L. GLENN/GARY O'NEAL
Engine IM Division
OCAMA, Tinker AFB, Okla.

Investigation of a J57 high pressure fuel tube removed from service because of fuel leakage from a small pin hole revealed that the hole was caused by cavitation erosion. In this case the erosion was attributed to a dent in the tube upstream from the hole.

Cavitation erosion is caused by relative motion between a metal surface and a liquid—in this case the inside wall of the tube and JP4. The cavitation is the result of voids (cavities) forming in the liquid then collapsing against the metal surface. In this failure the dent caused voids to form in the JP4 and then collapse downstream against the inner wall of the tube. Collapse of cavitation voids can produce impact pressures by implosion exceeding the yield strength of most metals.

When the voids collapse, the surface of the metal is subjected to repeated local plastic deformations that result in ultimate fracture and disintegration.

Maintenance activities should keep a sharp lookout for dents in high pressure fuel tubes exceeding TO limits. OCAMA (MMTTJB) is presently working to develop better methods (NDI) for inspecting fuel tubes and expects to have a procedure available by the end of 1971. ★



Top to bottom—High pressure fuel tube, dent in tube, cutaway showing hole and interior erosion of tube, exterior view of the hole.

REX RILEY'S
CROSS COUNTRY NOTES



Recently one of our crews had some difficulty while transiting a base and the aircraft commander took the trouble to have a conversation with the base commander. "If we had known who you were, we would have made sure that you got royal treatment," he was informed.

This worries me because the purpose of the Rex Transient Services program is to insure that all aircrews receive the very best transient service. That is why Rex travels incognito. He doesn't want "extra" or "special" attention. In fact, that would defeat the intent of the program.

* * *

We receive a lot of letters to Rex Riley, most of them having to do with the quality of transient services at Air Force bases. We can't print them all here but we are glad to get them and hope you will all continue to write. Here's one asking Rex to spread the word on a problem encountered by the 101st Fighter Group, Maine Air National Guard. They have a serious problem and we sincerely hope that by publicizing it here it will help prevent an accident.

"Since our transition to the F-101 aircraft we have been plagued with a drag chute problem on cross countries. More often than not somewhere along the way transient alert crews will service our aircraft with an F-4C drag chute. Usually these chutes are plainly marked or should be marked 'For F-4C Use Only.'

"TO 1401-3-42 specified after 25 deployments our chutes will be utilized by the F-4C only, primarily because of the importance of a good chute for F-101 pitch-up recovery. In addition to the safety of flight factor the unserviceable chutes cause an excessive loss of manhours and funds for new chutes.

"I hope the TO requirements can be brought to the attention of all parachute riggers and transient maintenance personnel."

The drag chute is an important piece of equipment, especially to the folks flying the F-101, so let's make sure they get the right chute every time. Thanks.

Rex

REX RILEY
Transient Services Awar

LORING AFB	Limestone, Me.
McCLELLAN AFB	Sacramento, Calif.
MAXWELL AFB	Montgomery, Ala.
HAMILTON AFB	Ignacio, Calif.
SCOTT AFB	Belleville, Ill.
RAMEY AFB	Puerto Rico
McCHORD AFB	Tacoma, Wash.
MYRTLE BEACH AFB	Myrtle Beach, S.C.
EGLIN AFB	Valparaiso, Fla.
FORBES AFB	Topeka, Kans.
MATHER AFB	Sacramento, Calif.
LAJES FIELD	Azores
SHEPPARD AFB	Wichita Falls, Tex.
MARCH AFB	Riverside, Calif.
GRISSOM AFB	Peru, Ind.
CANNON AFB	Clovis, N.M.
LUKE AFB	Phoenix, Ariz.
RANDOLPH AFB	San Antonio, Tex.
ROBINS AFB	Warner Robins, Ga.
TINKER AFB	Oklahoma City, Okla.
HILL AFB	Ogden, Utah
YOKOTA AB	Japan
SEYMOUR JOHNSON AFB	Goldsboro, N.C.
ENGLAND AFB	Alexandria, La.
MISAWA AB	Japan
KADENA AB	Okinawa
ELMENDORF AFB	Alaska
PETERSON FIELD	Colorado Springs, Col
RAMSTEIN AB	Germany
SHAW AFB	Sumter, S.C.
LITTLE ROCK AFB	Jacksonville, Ark.
TORREJON AB	Spain
TYNDALL AFB	Panama City, Fla.
OFFUTT AFB	Omaha, Nebr.
ITAZUKE AB	Japan
McCONNELL AFB	Wichita, Kans.
NORTON AFB	San Bernardino, Calif
BARKSDALE AFB	Shreveport, La.
KIRTLAND AFB	Albuquerque, N.M.
BUCKLEY ANG BASE	Aurora, Colo.



NUCLEAR SAFETY AID STATION



UNDERSTANDING OR DEFICIENCY?

The goal of nuclear security is to prevent unauthorized entry.

Permanent security facilities make the job of controlling entry relatively easy. Security fences, lighting, closed gates, fixed entry control points, etc., all announce the nature of the area and the risks involved in attempting unauthorized entry. The very permanence of the area almost rules out the chance of some unknowing person accidentally bumbling into it.

Frequently, however, nuclear weapons undergoing logistic movement are secured in temporary restricted areas. The temporary nature of the areas means that the location is not well known to the majority of base personnel, and the physical security facilities are usually not easily identifiable. In effect, the area is established around the resource, rather than the resource being placed in the established permanent area. AFM 207-10, paragraph 2-5, recognizes this fact and establishes specific requirements for such situations.

The following may help us understand why an increasing number of Dull Sword reports involve weapons in logistic transport status—and also point toward a cure. In every instance, the cause of the deficiency was identified as a breakdown in procedures or a failure to communicate, a misunderstanding between the host base Security Police and the logistic aircraft crew which resulted in a Dull Sword. It was the "temporary" relationship between people which was at fault, *not* the temporary nature of the holding facility.

The most frequent deficiency was premature removal of the ropes and stanchions forming the Close-In security area (no-lone zone). The Security Police thought their job was finished and the aircraft was ready to leave; the aircraft commander, who wasn't ready to leave, considered the weapon insecure when the tangible signs of the protected area vanished.

The aircrew must make crystal clear who it wants to have access to the aircraft, when access is permitted, how persons authorized access will be identified, and any special instructions. Only the aircrew knows for sure when the aircraft will depart and ground security will no longer be required.

If the host base has complied with AFM 207-10, only a purposeful attempt to penetrate or a breakdown in communication can cause a Dull Sword deficiency. In a temporary situation we are probably not going to achieve familiarity, but we must achieve *understanding*—or we'll achieve a deficiency. More to the point, we'll be degrading the security and safety of our aircraft and cargo.

HAVE A PROBLEM? REPORT IT!

Your problems will be solved only if the people responsible for the solution are aware they exist. That seems perfectly obvious, yet some people apparently prefer to live with a problem rather than report it. In the case of a 4000 pound capacity Baker forklift, a problem existed for seven years before someone brought it to our attention.

The problem is that when handling certain nuclear bombs mounted on a bolster, the bolster comes into contact with the forklift front tires if the forklift tines are fully inserted into the lift slots on the bolster. A spacer is being designed to solve the problem. Seven years ago was the right time for this to have been corrected. If only someone had reported it! Do you have an unreported problem? See AFR 127-4, Attachment 3, and TO 00-35D-54. ★



Toots

is interested in your problems. She spends her time researching questions about Tech Orders and directives. Write her c/o Editor (IGDSEA), Dep IG for Insp & Safety, Norton AFB CA 92409

Dear Toots

I am an Avionics Quality Control Inspector, primarily inspecting C-130E model aircraft. There has been considerable controversy regarding which electrical connectors on the aircraft require safety wire.

The only directives I have found with reference to the problem are TO 1-1A-14, para 16-6 and 16-7, and TO 1C-130B-2-8, para A1-17.

The 1C-130B-2-8 identifies aircraft by year and tail numbers which require all electrical connectors, which cannot be reached for inspection in flight, to be safety wired, while other affected year and tail numbers require all electrical connectors which are normally inaccessible for periodic maintenance inspection, except Bayonet-Type Coaxial connectors, to be safety-wired.

My questions are:

(1) Why the inconsistency between certain year and tail numbered aircraft as opposed to others?

(2) What is actually meant by periodic maintenance inspection? Does it mean the actual time scheduled periodic maintenance inspection or the periodic check that maintenance people are required to do every so often?

One example of the controversy we have faced here is the RT-289/APN-59 which is located in the NLG wheel well. This RT unit is accessible during ground maintenance or inspection but not accessible during flight. Does the connector (cannon plug) require safety wire?

TSgt Felton McFarland
Dyess AFB, Texas

Dear Mac

After looking over tech order 1C-130B-2-8 I agree, there could be quite a controversy over which electrical connectors should be safety wired.

The technical services representative at Robins AFB says that the inconsistency between certain year and tail numbered aircraft is due to engineering design and configurations; different series aircraft have different type equipment installed. The term periodic maintenance and inspection in TO 1-1A-14 means the day-to-day maintenance, such as that performed by the flightline specialists.

The technical Services Representative also stated that the RT-289/APN-59 located in the nose wheel well should be safety wired.

To be correct when installing or inspecting the various types of equipment, the specific tech order for that equipment will be your guide. Always do it in accordance with the tech order for the specific equipment involved and you can't go wrong. Toots

TECH TOPICS

briefs for maintenance techs

right the first time

Why not do it right the first time? After the pilot of an F-84 experienced difficulty in obtaining aft stick movement on final approach, the ground crew found that during a recent periodic inspection the dock crew had failed to tighten and safety the horizontal stabilizer actuator control valve adjusting bolt.

The bolt had worked out of adjustment after 16 hours of operation. There was no indication of a supervisory inspection after the work was accomplished.

Again, let's ask why not do it right the first time? Let's do it IAW the aircraft technical order and inspect it IAW 00-20-5.

plug goof

Just after takeoff the front engine oil pressure on an O-2 dropped to 10 psi and the pilot immediately returned to base with the prop feathered. The ground crew found the oil dilution connector plug missing, along with all the oil, which accounted for the low pressure reading.

The connector plug was found in the engine compartment. It had no hole drilled for safety wiring and apparently vibrated out during takeoff.

A ramp check of other O-2s revealed four additional connector plugs without drilled safety holes. All are now drilled and safety wired IAW the TO.

wrong tubing

When complete hydraulic failure occured on landing roll, the C-124 was stopped on the runway by the use of reverse pitch and air brakes.

Investigation revealed that the brake control valve pressure line was constructed from **aluminum** instead of **stainless steel.** The flared end of the aluminum tubing straightened out under pressure thus causing loss of hydraulic fluid. A ramp check revealed that one other aircraft had an aluminum line installed in place of the stainless steel as required by tech data.

tissue in the fuel

FOD takes all shapes and forms. In this case, a Kimwipe tissue found its way into a C-130 fuel cell during TCTO. The Kimwipe was overlooked by the inspector; the cell was closed, serviced and the aircraft released for flight.

Eleven days later the Nr 4 engine flamed out in flight and the Kimwipe tissue was found in the engine fuel strainer. Bits of tissue turned up in other fuel strainers, indicating it had worked its way through the system during fuel crossfeed. This incident points up the necessity for performing a thorough FOD inspection after performing maintenance and before signing the forms.

don't assume– know!

Upon arrival at the F-4 to perform a jettison check and arm the external tanks, the load team chief noticed that the wing tanks were dearmed, the aircraft armanent placard was blank, and there was no entry in the forms.

Assuming that the aircraft was dearmed, the team proceeded with the jettison check IAW the checklist. When the emergency release button was pushed for a voltage check, the centerline tank jettisoned. Fortunately, there were no injuries, but the tank was damaged.

The cause of this incident rests with the load chief. He assumed that the complete system was dearmed. Don't assume anything. Make a positive check in accordance with the tech data.

Contributing cause was that the unknown individual who dearmed the wing tanks failed to make the

proper form entry. Proper form entries are mandatory for all maintenance according to 00-20-5.

rag fod

After the pilot made a precautionary landing in an open field for unusual transmission noise, a large shredded rag was found in the transmission oil cooler pulleys of a CH-3E. Both drive belts were broken, and several electrical wires in the transmission compartment severed. The rag which had been left in the compartment during maintenance was picked up by the belts in flight and injected into the pulleys. The mechanic, supervisor and preflight crew all failed to catch this FOD, but the belts didn't.

wrong washer

The phase inspection was complete on the VT-29 except for an engine run-up and operational check. After a normal start and warm-up, the crew chief noticed excessive voltage drain during a prop feathering check and pulled the feathering button when it failed to pop out normally.

Continued on Page 24

JPA– a new tool

The development of new manuals by Air Force Systems Command's Human Resources Laboratory at Brooks AFB, Texas, may result in fewer flightline maintenance errors.

At the heart of this development is a system of new technical publications known as the Job Performance Aids (JPA), pocket-sized, job-oriented manuals which provide all of the relevant information for a given job but no more. Information is presented, by both illustrations and narration, in the exact chronological order in which each step of a job is to be performed. JPA manuals are supplemented by JPA troubleshooting guides that enable a technician to identify quickly and accurately a faulty part or subassembly.

Air Force depends on specialized and extensive training of its maintenance technicians to cope with the complexity of modern aircraft. With the advent of JPAs, however, relatively inexperienced technicians can perform highly complex maintenance tasks on an error free basis at speeds approaching that expected only from the most highly trained technicians.

So far, the guides have been produced for the UH-1 and CH-47 helicopters and the C-123K aircraft. Main objectives of the program are to reduce training time, reduce maintenance errors and increase work output with present crews.

The JPA system was recently tested for a period of four months at Charleston AFB, SC, on a fleet of 40 C-141A aircraft. Results of this test revealed that:

- Use of JPA manuals virtually eliminates maintenance errors for apprentice level technicians.
- Time required to train a productive technician can be reduced by 25 percent.
- JPA troubleshooting manuals enable **all** levels of technicians to reduce troubleshooting errors by 92 percent and reduce production time for troubleshooting by 11 percent.

Air Force is now reviewing and analyzing the results of this test with a view toward expanding the use of JPA to other aircraft and missile systems.

The fire guard signaled to cut the engine when he saw smoke coming from the left wheel well. The engine was immediately shut down.

The maintenance crew found a steel washer installed between the feathering motor terminal post and housing causing a direct short which burned the entire wiring to the DC bus.

The steel washer had been installed instead of a phenolic washer during the motor replacement. This error cost the maintenance crew 40 additional manhours to repair.

overheated cannon plug

The F-104 pilot experienced a rapid decompression during deceleration from mach 2 on a functional check flight.

After the pilot made a safe but speedy return to base, the maintenance crew found both forward and aft coupling assembling quick-disconnects loose on the bleed air shutoff valve allowing 17th stage air to leak onto the shutoff valve cannon plug.

This extreme heat had melted the solder causing the valve to fail to the closed position.

Maintenance bought this incident; fortunately it didn't result in an accident.

one that didn't happen

During TCTO compliance, egress personnel attempted to raise the ejection seat handles on the front seat of an F-100F in order to accomplish some sheet metal work. Max travel on the handles was about one and one-half inches. Closer inspection revealed that the inertia reel cable leading to the left handgrip had been misrouted behind the stress plate, restricting handgrip travel. **Had the need arisen, the pilot would not have been able to reach the ejection seat trigger!**

It just goes to show—failure to use tech data can kill somebody!

TECH

briefs for maintenance techs

TOPICS

no chute

In GCA pattern the F-100 pilot noted his oil pressure had dropped to 35 psi. He declared an emergency and made a full stop landing. Touchdown was good at 145 KIAS on the first 500 feet of runway. The nose wheel was lowered, flaps raised and drag chute handle pulled, but the drag chute did not deploy. He made several more attempts to deploy the chute without success. With an extremely wet runway, braking action was almost nil, so the pilot lowered the tail hook, turned off antiskid and locked both brakes. Barrier engagement was estimated at 65-70 knots. Both main tires blew.

The message said the reason for the low oil pressure was still being investigated; however, the drag chute failure was due to improper installation: (1) Maintenance installed it wrong. (2) Pilot failed to check the installation on preflight.

work cards

After waiting an excessive period of time for the gear to extend with hydraulic pressure remaining at 800 psi, the pilot elected to use the blowdown system.

The problem was traced to a gear door up pressure line that was chafing on a bolt in the wheel well. The continued chafing had worn a small hole in the line which resulted in subsequent loss of fluid.

Postflight work cards require inspection of this area for hydraulic leaks, loose items, chafing, etc. Had the work cards been properly accomplished the chafed line should have been found prior to failure. As supervisors we must continually stress the importance of using work cards during inspection.

only finger tight

Just after takeoff, fuel began streaming from the T-41 engine

marking on jet engines

Periodically engine maintenance personnel should be reminded that utilizing improper marking pencils could cause adverse effects on jet engines. So that everyone will be aware of the correct type equipment to be used in making temporary markings on hot section parts, the following is printed for general information.

When it is necessary to mark any hot section part during disassembly, inspection, repair, assembly or storage, only the following marking materials shall be used:

- **Chalk**
- **Dykem red, yellow or black**
- **Ink (Justrite slick-black; Marco S-1141; March stencil ink**
- **Soapstone**

CAUTION

Do not use grease pencils or any marking material that contains lead, copper, carbon, zinc or similar material. Use of these materials may result in a loss of fatigue strength, because they will introduce intergranular attack and/or carburization (carbon impregnation) when exposed to engine operating temperatures. If an engine part has been inadvertently marked with an unauthorized material, all traces of the material must be removed.

(US Navy CROSSFEED)

cowling. An immediate landing was made on the runway.

Investigation revealed that the hose connecting the fuel pump to the metering unit was loose. This hose had been removed for a fuel pressure check during prior maintenance. When the line was replaced it was only finger tightened.

for want of a nut

During a UH-IF functional check flight a high pitched whine followed by complete loss of tail rotor control dictated an immediate landing. Postflight revealed that the tail rotor drive shaft had separated at the coupling immediately aft of the 42° box.

The four nuts that attach the coupling to the 42° box had been left off during maintenance!

a chain of weak links

The engine in a T-41 froze after a few minutes of flight and the pilot had to put down in a wheat field.

Would you believe?

1. During a scheduled oil change the tank was not reserviced.

2. The maintenance supervisor missed it.

3. The pilot was observed checking the oil on preflight. The indication he may have seen could have been residual oil which remained on the dip stick.

ingestion indigestion

The A-7 armament crewmember had just removed the pylon and weapons safety pins. As he was crossing under the aircraft in front of the nose gear to stow the pins in the compartment on the left side, the MAU-12 safety pin was caught by the intake vortex and jerked from his hand. Result: ingestion into the engine necessitating an engine change.

undesired HH-43 flight

The HH-43 crew had responded to a selective response (ground run only) alert. As the APU was disconnected and the rotor brake released, the collective pitch control came up. The pilot was unable to overcome the up force and the helicopter lifted approximately 50 feet above the ground, then crashed on its right side.

The cause was traced to a missing engine fuel control overspeed governor drive shaft. The shaft had been left out during unauthorized maintenance by an untrained mechanic assigned to the unit. ★

Ops topics

A MATTER OF LIFE AND BREATH

The jet fighter was being ferried to the west coast. After about one hour of flight, the pilot recognized hypoxia symptoms, including visual blurring and inability to hold a steady altitude and course. A check of the regulator disclosed no abnormalities, except that the quantity gage had not decreased appreciably from the preflight reading. The pilot selected 100 percent and checked his hose connections and mask, finding them to be okay. His breathing continued normally, but his hypoxia symptoms did not clear up. He then selected "test" position and, after a short time, his hypoxia symptoms disappeared and the quantity gage showed a decrease.

The pilot elected to continue on to his destination, some 40 minutes away and pressed on *at FL 240* —both actual and cabin altitude—using the "test" position every few minutes to dispel gross hypoxia symptoms.

An EUMR resulted in a complete functional test of the regulator. The test showed that the regulator had been improperly adjusted when installed and was not delivering sufficient oxygen.

The flight surgeon estimated that the pilot had been without sufficient oxygen for three-five minutes when the symptoms first appeared—and that just happens to be the time of useful consciousness at FL 240. As the flight continued, with intermittent use of "test" position to dispel the symptoms, there was a continual risk of losing consciousness or losing effective functioning.

We can't know for sure how close this pilot came to unconsciousness, but we suspect he wasn't far away —and this is exactly the sort of low priority pressing that keeps our Get-there-itis accidents in the spotlight. We've said it before and we'll say it again: If you suspect hypoxia, *descend* as soon as possible to below 10,000 feet; consider using your bailout bottle (which provides 10-12 minutes of oxygen); *land* as soon as practicable and get yourself and your airplane taken care of.

YOU CAN'T GET THERE FROM HERE

One of the more embarrassing things that can happen in an emergency is having the crash rescue vehicle crash. One unit recently had one of its vehicles damaged to the tune of $23,000 when the vehicle, responding to an aircraft crash, took off down an unserviceable road. More important, the vehicle never reached the scene of the accident!

This instance underlines the need for frequent surveys and up-dating of Crash Grid maps, as required by AF Manuals 92-1 and 127-1. If Grid maps aren't kept up to date, crash rescue vehicles, especially some of the newer, bigger models, might not be there when we need them the most.

AERO CLUB MISHAPS

• An AF pilot was taking a busman's holiday, shooting touch-and-go landings in the Aero Club's Cherokee 140. After ballooning the aircraft in the flare, the pilot lowered the nose too quickly and caused the propeller to strike the runway. The aircraft became airborne again, and a second nose-down control input resulted in the propeller again contacting the runway. The nose wheel strut failed at this point, and the aircraft slid to a halt.

The pilot had been checked out previously in the Cherokee 180, but this was his first flight in the 140. It is the policy of this club—and of several others that we know of—that currency in the 180 carries automatic currency in the 140. It was the opinion of the investigator that at least a one-time checkout should be required for aircraft with dissimilar trim controls and less power available—especially when pilot experience in light aircraft is limited, as in this case. We share that opinion.

• A private pilot departed his home station on a cross-country flight in the club's Cherokee 140. After landing at destination and closing out his flight plan with Flight Service, he took off again without filing a flight plan. The wreckage—the pilot miraculously still alive—was found five days later in a heavily wooded area near a friend's ranch house.

We wonder how many times, since Orville and Wilbur's day, a pilot has crashed in a friend's back yard. And how many times rescue has been late—sometimes too late—simply because the pilot didn't take the trouble to file a flight plan!

HABIT PATTERN TRANSFER

One of the problems attendant to transitioning from fixed-wing aircraft to helicopters was illustrated recently. An IP and his pilot student were on a transition training mission in the HH-43B. At 500 feet AGL the IP requested that the student initiate a simulated engine failure. The student entered autorotation, called out the procedures, checked his power instruments and turned the helicopter toward the taxiway and into the wind. All was normal until about 10 feet AGL, when the student unconsciously applied aft cyclic (roundout) and rotated the nose for landing similar to the roundout in a fixed-wing aircraft.

The landing was firm, but not hard. However, examination after landing disclosed considerable damage to the tail assembly.

One recurring problem in the IP business is staying ahead of the student. Helicopter IPs should certainly keep in mind the tendency on the part of fixed-wing pilots to revert to fixed-wing techniques in the landing phase.

NO, NO!
I SAID "CHEER UP!"

After landing, the IP, making the landing from the right seat, called for "flaps up" to the flight mechanic and lowered the nose. The landing gear horn started to blow, the red landing gear light came on and, as the nose of the aircraft settled to the runway surface, both propellers contacted the runway. After about 2000 feet of slide, the aircraft came to a stop and the crew and passengers exited over the flaps, which were still down. Noticing that the flaps were still down, the flight mechanic returned to the cockpit to check the position of the handles. Sure enough—flaps down, gear up.

Bad luck plagued the flight mech, for he shouldn't have been able to make that particular mistake if the aircraft gear safety system had worked properly. Inspection showed that the landing gear safety up switch on the right main gear was badly corroded, probably allowing the safety lock solenoid in the gear handle to be retracted whenever the battery was on, making it possible for the gear handle to be raised even with the gear on the ground.

Bad luck plagued the IP, too. He fell and broke his leg getting out of the airplane.

FLIP CHANGES

Positive Control Areas: These areas within the continental United States have been realigned. Aircrew attention is directed to the Flight Planning Document Section II, page 76, North and South America for complete information. Future changes in the positive control area are anticipated and will be noted in this article as they occur.

VOLMET: Effective July 1971, VOLMET data was deleted from Section III, FLIP Planning and is now available in each FLIP Supplement (except United States) under appropriate ACC/FICs and individual aerodromes. All aircrews will now have VOLMET data more available to them while flying.

TIGHT SQUEEZE

The two-ship flight went beautifully—up until takeoff.

Lead took the active and lined up on the right-hand side of the runway, Two close behind and tucked in good and tight. Run-up was normal, all instruments checked good, and Lead turned to his left, got an "okay" signal from his wingman and gave the "GO" signal with a firm nod of his head.

Unfortunately, Lead's brakes didn't release. Two's did, though. CRUNCH!

And on a 150-foot-wide runway . . . if it's possible, someone will find a way.

ALTERNATE FUEL

A. G. SMITH
Directorate of Aerospace Safety

The Enroute IFR Supplement lists several Naval Air Stations which have only JP-5 fuel available. USAF aircraft using these facilities will be refueled with JP-5 which is a suitable alternate for most USAF jet aircraft. However, *there are precautions which must be observed.*

The flight manual for each aircraft lists the approved alternate fuel and the applicable operating limitations. Two of the more important items to remember are that

Ops topics

FUEL *CONT'D*

JP-5 does *not* contain an anti-icing additive and that it has a higher freezing point. The absence of anti-icing additive requires special emphasis on draining water from the fuel tanks and the use of fuel heaters on aircraft so equipped. The higher freezing point of JP-5, −51°F, may limit high altitude operations. Most flight manuals caution against flying at altitudes where the outside air temperature is 10° above the fuel freezing point or colder.

JP-5 fuel has a higher specific gravity than JP-4 and some engines, such as the J79, have a specific gravity setting on both the main and afterburner fuel controls. A corresponding change in gravity setting is recommended when using JP-5. Because JP-5 is less volatile than JP-4, engine starting may be more difficult both on the ground and at altitude.

The applicable flight manuals are the governing criteria any time it is necessary to use alternate fuel. TO 42B1-1-14, *Fuels for USAF Aircraft,* is also an excellent reference on the use of alternate fuels.

WATT'S NEW?

In a sister service, the pilot of an A-6 was on night takeoff. On liftoff he actuated his trim switch and received a severe electrical shock—*enough so that he was unable to control the aircraft or release his grip on the throttles or stick.* The aircraft rolled right, the nose fell through the horizon about 300 feet AGL, and only the quick reaction of the Bombardier/Navigator, who knocked the pilot's hand away from the stick, allowed for recovery and saved the aircraft and crew from an imminent fatal crash.

The trim toggle switch cover had come off on take off, exposing the metal shaft which carries 115 VAC. The pilot was wearing Nomex flight gloves which were damp from 45 minutes in the pattern, and we suspect that the intensity of the electrical shock was increased by the pilot being grounded through touching the metal part of the throttles.

Pilots who have received minor shocks from sources of this nature should not underestimate the seriousness of the discrepancy. The degree of shock depends on what other metal objects the pilot may be touching, and that mild shock you felt today might be a fatal shock to someone else tomorrow. In this instance, the pilot was completely helpless—he could not control the aircraft, eject, or even let go of the controls.

Any pilot experiencing a shock, however mild, should ensure that the aircraft is written up and grounded (both ways) until the problem is corrected.

GARBAGE ON GUARD

According to FAA, a serious problem exists caused by non-emergency transmissions on 243.0 MHz, mostly from personal emergency locator "beepers" of the type associated with military parachutes. A survey of selected ATC facilities indicated that nearly 1000 false emergency transmissions had been received by these facilities from 1 January to 9 March 1971. Transmissions varied from short bursts to one transmission of 14 hours and 12 minutes.

One interesting note comes from a report made by a West Coast Naval Air Station: "During the month of December, the time of PRC/PRT (Beeper) signals totaled 3506 minutes. The seriousness of this problem now comes into focus. For this staggering period of time, guard channel was clobbered and any actual emergency would have been 'out of luck'."

The problem is getting worse instead of better, and only a concentrated effort by all concerned can resolve it. All installations handling "beepers" should review and evaluate their monitor and control programs. All personnel must take care to avoid an inadvertent triggering. Having a bona fide MAYDAY blocked out because of someone's carelessness is inexcusable.

NO PUSHEE, NO PULLEE

After takeoff from an outlying base, the O-2 pilot found he couldn't raise his gear. A flyby of the tower indicated that the gear was down and appeared normal, so he headed for home station where another aircraft could join on him and give the gear a closer inspection.

All cockpit indications were normal, but the chase plane pilot stated that the nose gear strut and scissors appeared to be over-extended. As precautions, the runway was foamed and crash equipment was called out.

On final approach, the pilot, hoping to minimize damage to the aircraft in the event of nose gear failure, attempted to feather the front engine. He pulled the front engine mixture control to idle/cutoff, and placed the *rear* engine prop control lever to feather. Its capability of flight severely hampered, the airplane settled smartly to the ground well short of the runway. The pilot was uninjured, but the aircraft was damaged beyond economical repair. ★

EXPLOSIVES SAFETY

HY BOSCH, Directorate of Aerospace Safety

"WHAT FOOLS THESE MORTALS BE"



It appears that the silly season is upon us. When a silly act occurs in conjunction with the handling of explosives, then it leaves the realm of the ridiculous and crosses over to the unforgivable.

For instance, at an aerial port this series of actions could have ended in disaster—in this case it was merely embarrassing. During a routine check of unaccompanied luggage, customs inspectors discovered a cache of explosives shipped by an officer returning from overseas. The contraband included demolition explosives, primer-detonators, small arms ammunition, and six tear gas grenades. This shipment had already jeopardized countless innocent lives through its unauthorized movement. Enter now on the scene the professional expert, an EOD technician charged with safely removing this material. Instead of packaging the items, he attempted to remove all six of the grenades in his arms. He was halfway out of the building when a swinging door jarred one grenade loose from his hold and it bounced off the floor. Only the tear gas grenade's protective container prevented a rather tearful ending to this circus act.

Another individual was instructing a class on the M49A1 trip flare. In picking up the flare he neglected to hold his hand over the spoon to check that the safety pin was installed. The pin fell out, the spoon flew off, and the flare ignited in his hand. All in all the instructor and his class shouldn't soon forget that demonstration.

Another instructor, this time an aircraft gunner, positioned himself in front of a 7.62mm weapon, removed the barrel safing pin, and rotated the barrels. Besides making himself an opportune target, he failed to insure all rounds had been removed from a previous mission. One round fired, catching him between the big toe and first toe. Lost time six weeks. Needless to say, he was removed from instructor status. Another case of "do as I say, not as I do."

EOD personnel burning 20mm target practice ammo in a pit failed to wait the required cooling down time before picking up unspent rounds. Result, one lost finger and fracture of two more.

An airman assigned to range clearance duties picked up what he thought was a burned out MK24 flare. He figured the weight of the flare was due to impacted earth imbedded in the flare. He thought wrong! The flare was live, the lanyard was pulled and his thigh was burned.

These incidents display that both the amateur and professional have no margin for error when it comes to handling explosives. ★

TO

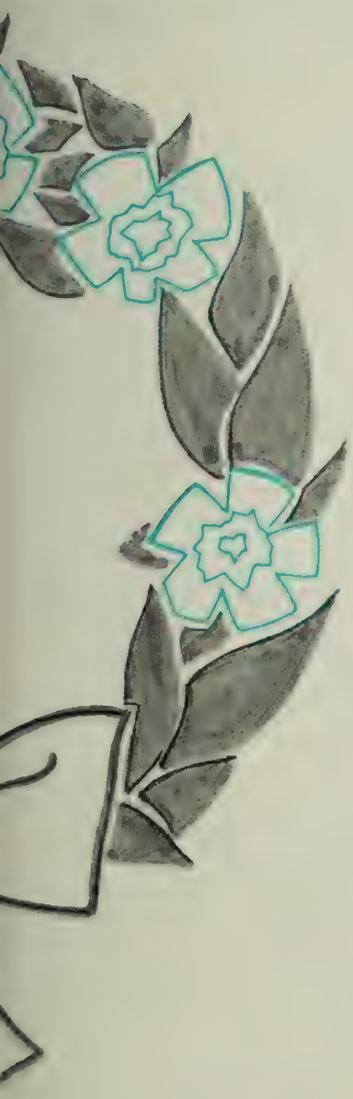


It had really been a nice morning. The weather was clear and with no wind, the pilot figured on some good scores on the range. He had just pulled off the last dive bomb run when the instrument gages began to spoil things. The first indication of trouble was flashed by the oil pressure light which came on strong. It was supported by mild compressor stalls and a decrease in RPM. When both vibrations and the EGT increased, he elected to shut it down. The zoom off target had carried him to 2000 feet. Since no possibility existed for a dead stick, the pilot wisely activated the exit handle and successfully completed his unplanned maneuver.

It wasn't long until the accident investigators were on the scene, poking around the smoking hole to determine what had happened. Fortunately, enough of the pieces were still intact to enable them to determine the cause of the accident. A teardown of the engine and accessory case revealed a *SOAP sample bottle in the oil system.* The investigation team's first reaction was to begin a hunt for the individual responsible for this act. However, after much discussion another very significant point was brought out by one of the board. *Why would a maintenance troop drop the bottle into the filler neck and fail to tell someone about it?* Was he afraid of disciplinary action? Let's consider the possibilities in this case.

This accident was easily preventable. All that would have been necessary was for the individual responsible to go to his supervisor and admit that he had made a mistake. Yet the implications are that he was afraid to do so. No one will deny that our objective is to perform the mission—if possible with "Zero Defects." The most frequent ob-

ERR



stacle to our reaching this goal is people. That is, people are human and therefore subject to committing errors. If we fail to accept this, then accidents will continue to happen.

If Joe Airman, working on the flightline, has the feeling that every time he makes an error he is going to have his finger stuffed in the pencil sharpener, then the chances are that we will never know about his mistakes until we dig them out of a smoking hole.

We have to make sure that we impress upon everyone that occasional mistakes will happen. While we cannot condone errors, we must leave the door open so that individuals will feel free to come in and admit that they need help or that it just isn't possible to complete the task properly in the time allotted.

The key to the problem lies with the supervisor. If he is the type that paces the flightline with a big whip and snarls at everyone who commits an error, then he is setting up a situation conducive to an eventual accident. Or he might be an ops officer who gives all the pilots the impression that he won't accept any deviations in the schedule and, therefore, they might end up flying a bird that maybe isn't just right.

There are some people who work better under pressure but most psychologists agree that a relaxed atmosphere is the best way to realize maximum production. When an individual lives in constant fear of censure if he commits an error, you can bet your bottom dollar that you will never hear about any problem area unless you happen to stumble on it.

Fear of recrimination has probably cost us many a pilot. A commander who has a policy that heads will roll if you bash an airplane has perhaps caused a delay in the ejection sequence when there was no hope of salvaging the situation. It is a welcome feeling when the boss says "people are my most important resource and if something happens that you think dictates leaving the bird, get out and live to fly another day."

The point that must be clearly understood is that, while we don't condone mistakes, once one has been made, let's clear it up and prevent the chain of events that leads to an accident. No one is perfect, so we must realize that, as long as we perform at a job, someday, somehow we will make a mistake. What we have to establish is a climate in which the individual can go to his supervisor and admit he erred. Then we cannot only correct that mistake, but we can take the measures necessary to insure that the same man will not commit the same error again.

Basically, what we have said here is that good supervision can prevent accidents. And that is the only kind of supervision we can afford.



mail call

T-38 GRAPH

Just received your May 1971 issue of *Aerospace Safety* magazine and was digesting every article when I turned to page 21 and saw the glaring error on the graph point for 1969. It appears the illustrator had a lot of extra "2s" and no "1s", or his graph line made a nosedive when it should have climbed.

Although I'm primarily responsible for Ground Safety, I enjoy reading your magazine and get good, useful information from it.

By the way, since it takes so long for us up here at Thule, Greenland, to receive your magazine, maybe TOOTS could deliver the next issue personally. I know a lot of guys who would leap up in the air and kick their heels together . . . in a safe manner, of course.

MSgt Ralph E. Newman
4683 Air Base Group
Thule AB, Greenland

Sorry about two things, Ralph: The mistake on the graph—the 2.6 should read 1.6; and TOOTS isn't cleared for magazine delivery. Thanks for writing.

SONDRESTROM TRANSIENT SERVICES

Every transient aircraft commander who comes through Sondrestrom is asked to fill out an evaluation form upon entering Base Operations. Every morning the Base Operations Officer evaluates each form or, if the need arises, he evaluates and takes necessary action immediately.

Our Transient Alert and Base Ops Dispatchers are composed entirely of Danish personnel and a prouder people you will never find, especially when it comes to providing good service to transient aircraft.

I wish you would have Rex Riley make a trip up here someday because I am sure these people would earn the Transient Services Award.

TSgt Ronald J. Goodboe
4684 Air Base Group
APO New York 09121

You are to be commended, Sergeant for taking such an interest in the troops who provide the transient services. We'll try to see that Rex visits you in the near future.

BROKEN NOZZLES

I'm writing in reference to the article, "Would You Use This Nozzle," May 71 *Aerospace Safety*. The author makes the statement that "good maintenance practices would have replaced all of the broken handles." In this case I believe that good maintenance practices are not the factor here and the implication shouldn't be made. The fact is that the daily operator's inspection, utilizing the AFTO Form 371, would have and should have dictated what should have been done.

Personally, I've seen quite a few refueling operations and, in many cases, the vehicle operator would pull the hose off the reel and throw the nozzle to the ground.

Please don't imply that the maintenance was primarily at fault. Vehicle Maintenance personnel pull inspection on refueling equipment at 90 day intervals. A lot can happen in 90 days.

Capt Joseph N. Cupurdija
4900 Air Base Group
Kirtland AFB, New Mexico

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UNITED STATES AIR FORCE

WELL DONE AWARD

Presented for outstanding airmanship and professional performance during a hazardous situation and for a significant contribution to the United States Air Force Accident Prevention Program.

Captain THOMAS A. GIBBS



USAF Air Demonstration Squadron (Thunderbirds), Nellis AFB, Nevada

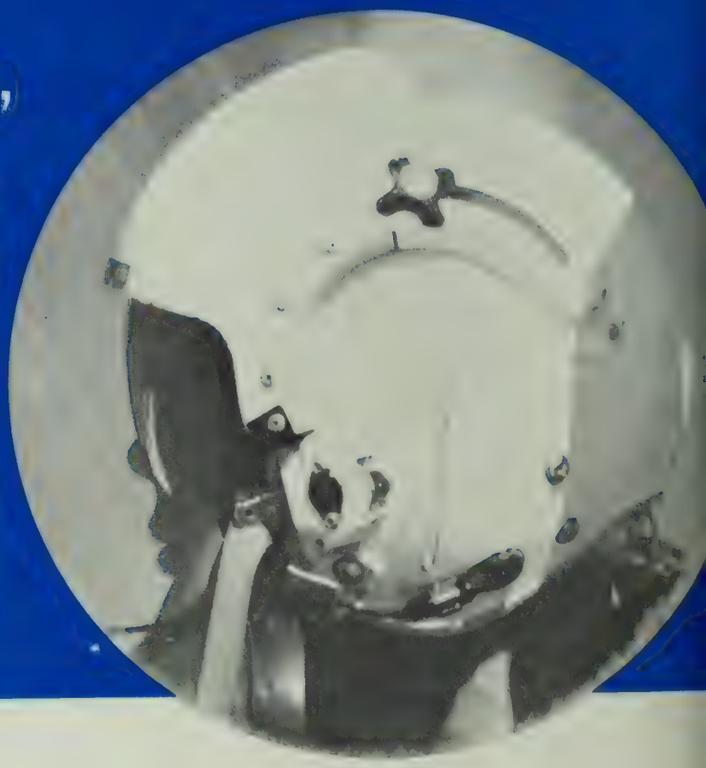
Captain Gibbs was flying slot position in an F-4E ring a low altitude Thunderbird training maneuver en his aircraft and that of the right wingman col- ed. Captain Gibbs' aircraft immediately began severe illations; however, by smoothly blending back pres- e and right aileron, he was able to stop the oscilla- ns and climb to a safe ejection altitude. Visual in- ction revealed the rudder completely missing and jor damage to the right horizontal and vertical stabi- rs. By using almost full right aileron to keep the gs level, he continued to climb to 18,000 feet, wed the aircraft to 250 knots, and performed a con- llability check. As he further slowed to 180 knots, re severe, unpredictable control inputs and vibra- ns were encountered because of the horizontal sta- zer damage.

Captain Gibbs approached the bailout area with his F-4 under marginal control, but decided to continue his flight in an effort to determine minimum controllability speed. At 170 knots, full right aileron was required and maximum vibration occurred. He decided to attempt a landing at 180 knots with an approach-end barrier engagement. Once established on final approach, Captain Gibbs had considerable difficulty remaining lined up with the runway due to the vertical stabilizer being bent to the left. However, by holding about 12 degrees right bank, he continued his approach, landed and successfully engaged the barrier.

Captain Gibbs' superb airmanship, combined with his calm, logical approach to a serious emergency, saved a valuable aircraft. WELL DONE! ★

Get-home-itis

a disease,
generally of short duration,
from which the subject
either quickly recovers
or to which he
may succumb.



SYMPTOMS:

Determination (often of the pigheaded type) to press on, regardless of weather, condition of the aircraft, his own condition. Subject develops great capacity for rationalization.

REMEDY:

Liberal dose of good judgment. Intelligent treatment by boss, wife, girl friend has been known to work wonders.

29.1305
FLYS

UNITED STATES AIR FORCE • SEPTEMBER 1971

Aerospace SAFETY

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Air Force fire fighters approach an F-105 Thunderchief which developed hot brakes during landing. U. S. AIR FORCE PHOTO, Det. 5, HQ AAVS.

SEPTEMBER 197

UNITED STATES AIR FORCE

Aerospace SAFETY

FOR AIRCREWS, MAINTENANCE & SUPPORT TECHNICIANS

SPECIAL FEATURES

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SEPTEMBER 1971 AFRP 127-2 VOLUME 27 NUMBER 9

ACCIDENT/INCIDENT REPORTING

Does this letter sound familiar to you? It may if you have a good memory. The message was one that the then Chief of Staff, General Curtis LeMay consideed important. It's just as meaningful today as it was 11 years ago.

You are well aware that complete, accurate, and objective reporting is basic to any accident prevention program. Our success in safety during the last 15 years has resulted largely from lessons learned from previous mishaps. In some cases, a single report was enough to provide evidence for corrective action.

Further reductions in aircraft accidents can be made by efforts based on complete facts of all occurrences that could lead to accidents. Our missile inventory makes thorough reporting of every incident mandatory. The importance of maintaining a zero rate in the nuclear field moreover, makes it imperative that the Air Staff be completely apprised of every incident.

Incidents are symptoms of accidents that may occur. But there appears to be a lack of enthusiasm in some quarters about reporting. There may be some doubt in the minds of our people as to how these reports are used. For years it has been Air Force policy that accident/incident reporting not be used to place blame nor serve as a basis for disciplinary action. Yet, of course, subordinate commanders feel that they are under pressure to create a good record.

However, I believe that reluctance to report incidents and accidents stems mainly from a lack of understanding of their extreme importance. Because the ultimate value of each report is not always apparent at base or operating level, I am requesting you to encourage your subordinate commanders to report all aircraft, ground, missile, and nuclear mishaps completely, promptly, and honestly. Individually and collectively, such reports become the basis for modifications, changes in design criteria and staff actions which bring about safer operations.

I ask you to emphasize the importance of submitting incident and accident reports and to remove any real or imagined barriers which may color the truth or hide the facts. ★

ONE CANDLE FOR THE C-5

In June, the 437th Military Airlift Wing at Charleston AFB completed one year of C-5 operation. To get a handle on what has been learned and the problems encountered in servicing the C-5, we talked with the people at Dover AFB and Rhein Main AB who have been handling and servicing the C-5 since it became operational in June 1970.

We learned that servicing the C-5 during through flight has not presented serious problems, due to extensive preplanning and training before the aircraft began transiting the MAC system.

The following is intended primarily for non-MAC people who may find themselves servicing, loading and unloading the C-5 without the benefit of extensive training and preparation.

"Although it's the biggest in the world, the C-5A is just another airplane." If you believe that, and you will be having anything to do with the C-5, then you'd better rethink. The C-5 is NOT just another airplane.

Size alone presents some problems, which we'll discuss as we go along. Size also means bigger engines which, in turn, mean trouble, mainly because of the blast effect in the wake of those engines. The blast from any of the heavy jets can erode unstabilized areas on the sides and ends of the runway, take out runway markers, roll up PSP. It can throw rocks and other debris like bullets and make workstands practically fly without wings.

Obviously, you don't just pour on the power in the C-5 without taking certain precautions. Drivers of ramp vehicles must be made aware of the hazards behind the C-5 when the engines are running. Care must be taken to see that all AGE is removed from the engine blast area and positioned so that when the bird taxis and makes a turn the wake is not directed at the AGE or blowing across the active runway. The most serious problem in this regard occurs when the aircraft begins to taxi; breakaway power is sufficient to cause havoc if the area behind is not well secured.

The size of the C-5 creates illusions. For example, people think it is flying lower than it is. Reports have been made that "a C-5 just flew over at 400 feet." Such reports have to be investigated and the fact is, the bird just looks like it's lower than it really is. People will tell you the C-5 is very noisy. Of course, it makes some noise, but not that much. It's a case of people seeing an engine that size and assuming that it has to be noisy.

So far, with more than one year of operation, there have been relatively few problems with handling and servicing the aircraft. Bear in mind, of course, that only trained MAC people have been handling the C-5. Therefore, if you are expecting the C-5 to visit your non-MAC base, pay attention.

First off, the C-5 will eat up a big part of your flightline—like 194,000 square feet of it just for parking. As for parking, the area

should be relatively flat. Problems in kneeling the aircraft have been encountered at bases where there is a crown in the ramp. If you can park it near a fuel pit, that will help. A full load of fuel is 49,000 gallons. During refueling, especially at an installation that does not have regular and frequent C-5 traffic, it would be advisable to have a fire truck standing by. It is possible to get a rather large fuel spill. Firemen should know the pattern a spill would assume at that spot and which way the fuel would travel.



Marshaller directs incoming C-5A to parking spot at Rhein-Main Air Base, Germany



Fueling and concurrent cargo loading and offloading are permissible and normally shouldn't present much of a hazard.

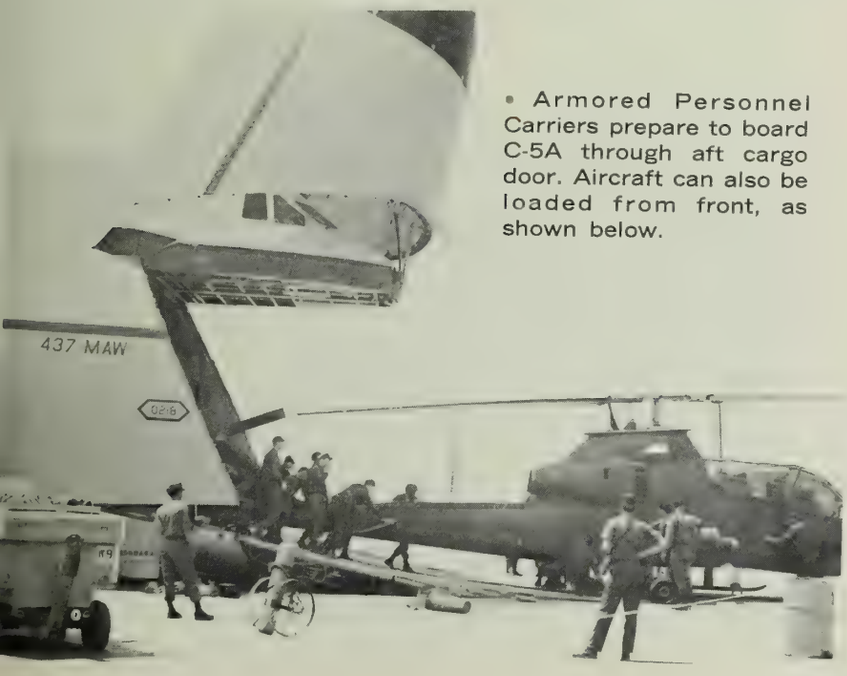
As for loading and unloading the C-5, traffic people tell us it's a piece of cake, although its capacity is enormous. To give you an idea, the C-141 can take 10 pallets in one row. The C-5 gulps up 36 in two rows. Cargo can be loaded from either end simultaneously, or while one row of pallets is being offloaded, loading can be in progress on the other side.

Cargo on wheels, unless it is palletized, can be loaded only when the aircraft is kneeled.

An efficient method seems to be for the cargo to be pre-spotted and one K-loader parked at the aircraft. Another K-loader is used to transport pallets to the parked K-loader for transfer to it and thence into the aircraft. There is also a huge air transportable dock for cargo loading and unloading, but only limited use has been made of it so far.

Pallets built up for either the C-5 or '141 are interchangeable. However, there should be no protrusions, since there is very little side clearance in the C-5.

We don't know what the record is but we have been told that a C-5 has been unloaded and reloaded with 36 pallets in about two hours. So it shouldn't be difficult to meet



• Armored Personnel Carriers prepare to board C-5A through aft cargo door. Aircraft can also be loaded from front, as shown below.

C-5

the current 4:15 standard turn-around time.

Unless there is major maintenance required, and a MAC team would be brought in to accomplish this, turning the bird around shouldn't be too much of a problem, provided the necessary precautions are taken. However, there are certain hazards.

Because of its size and various compartments, the airplane can accommodate a lot of people at one time, so access to the aircraft should be controlled.

Generally the forward crew door is kept closed and entrance to the bird is by the aft troop entrance door where each man working in the aircraft is logged in and kept track of either by interphone or by reporting to the supervisor in person. For turn-around, MAC units are using a Quick Service Supervisor, who is in charge of the aircraft during servicing. At some transit bases the aircraft is roped off and access is rigidly controlled—by the maintenance crew while work is being accomplished, by the Security police after the bird is buttoned up.

Under no circumstances should anyone be allowed on the upper surfaces of the wing or fuselage without protective equipment. These surfaces are fitted with attach points to which a worker can fasten his personal harness. Experience has shown, however, that if he has to move around very much, it is more convenient to attach a rope from one wingtip to the other and let the man attach to the rope. This gives him much more latitude and he doesn't have to be continually connecting and disconnecting as he moves about. The hazard here, of course, is the height of the C-5. A fall from the top of the wing or fuselage could very well be fatal.

People working inside the aircraft should be prebriefed on the various means of escape and the location of fire extinguishers and masks.

The only two C-5s lost were destroyed on the ground by fire. So, unless we have solid ivory between our ears, this should have some significance. If the C-5 is coming to your base you will want your fire department to have a good pre-fire plan. The plan should cover both ground and airborne emergencies that would necessitate a landing or result in a hazard during landing. It should insure that firemen know the interior layout of the aircraft to include seating arrangements, the location of all entrances, emergency exits and escape devices, hazards to contend with and the location of critical switches and components. In case of an engine fire, firemen will want to know:

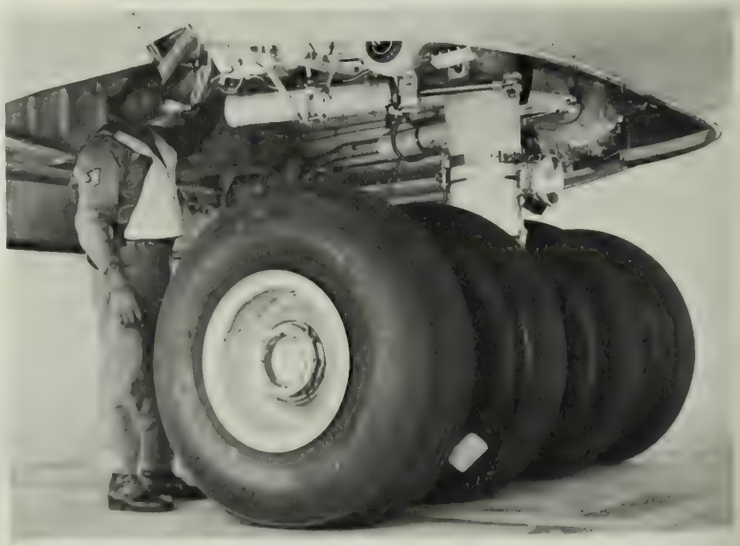
- When the flight crew is aboard they can use the aircraft system to extinguish the fire. Otherwise, firemen will have to do the job. Since foam and CB are corrosive to the engine, CO_2 should be used.

- Shooting the agent directly into the fan area would be futile—the agent would go right through the engine.

- Cowling or access doors must be opened in order to introduce the suppressive agent. If they can't be opened, then a bayonet nozzle would have to be used to pierce the pylon skin.

- There are fuel, hydraulic and bleed air lines in the pylon. Knowledge of their location is essential for fire fighters.

To a fireman, the C-5, for practical purposes, is not an airplane but a sort of metal warehouse. Attached to the roof are long storage tanks that may be full of highly flammable fuel. His first job is to protect and rescue any people aboard the aircraft; his second, to extinguish the fire. With an airplane the size of the C-5 these responsibilities demand adequate equipment, fire fighters



Quick Service Maintenance NCO installs nose gear pin.



Refueling—C-5A can be fueled at rate of 2400 gallons per minute through four single point receptacles with 600 gpm rate each.

rained in the peculiarities of the C-5, and a well thought out pre-fire plan.

Now, remembering that we are alking primarily to non-MAC peo-le, how prepared would your tran-ient maintenance people be if a C-5 were to land at your base? Maintenance people have been uick to laud the C-5 design. For he most part, systems are easily ccessible indicating the aircraft was esigned for easy maintenance. Iowever, there are a few things ou'll want to watch for:

• With any wind the fan in the ngine intake will turn, how fast epending on the wind. A careless an working in that area could se a hand.

• Unless you are fully qualified, ave the fore and aft cargo door peration to the loadmasters. They now the systems intimately. There as been one mishap in which the aintenance crew fouled up and sconnected the aft door.

• Under certain circumstances, ith the engines not running, the thrust reversers can be actuated. Bad news, if someone is working on the engine in that area.

• The ram air turbine can be deployed accidentally and could injure a person.

• Make sure maintenance people work on-handle-actuate only those systems they are qualified for. This includes AGE.

At the present time only aircrews are qualified to taxi the C-5. This operation is a bit more complicated than with a smaller aircraft and generally requires five people on the ground—a marshaller well out front where the pilot can see him over the nose, another man closer in who passes signals to the marshaller for relay to the pilot, two wing walkers and one man on the tail.

When the aircraft is not kneeled, the bottoms of the outboard engines are 7′11″ above the ground and the inboards 10′9″. So FOD would not seem to be a problem. However, there have been several instances of engine damage, so the potential is there. In one case, the cause was identified as a wrench left in the engine intake.

Another item that bears close watching is panels. There have been several losses and some of the panels on the C-5 are quite large. Be sure they are buttoned up securely after any maintenance.

An unusual occurrence that probably could be related to the size of the C-5 resulted in a fire and, under slightly different circumstances, might have caused serious damage or even loss of the aircraft. It was a hot day and one of the maintenance men took off his fatigue jacket and laid it on the ground. Some tidy type, picked up the jacket and hung it on the landing light mounted on the nose gear strut. Meanwhile, the exterior lights were being tested by one man in the cockpit operating the lights and another on the ground to observe when the lights were on and off. After checking the left wingtip lights, the man on the ground moved to the nosewheel landing light which had been turned on. By the time he got there the fatigue jacket was burning merrily.

So far the aircraft has been operating almost entirely within the MAC system and all the bases where it would land were surveyed in advance. Items covered include runway length, width and obstructions, taxiway widths and obstructions, parking ramp size and accessibility, cargo loading/unloading capability and the availability of POL, servicing, maintenance support.

One of these days you may look up and see what looks like the *Queen Mary* coming down final. That will be the C-5. Treat it with respect. It is already doing a big job for the Air Force and in the future will undoubtedly do a bigger one—the kind of job befitting the current heavyweight champ of the world. ★

...TO COME IN OUT OF THE RAIN



The mission was a T-38 out-and-back, homebound, a short hop. Forecast weather was 4500 broken, 25,000 broken, visibility seven plus, gusty winds and a few thunderstorms in the vicinity. The crew attemped to maintain VMC around thunderstorms enroute, then accepted vectors from Center through what appeared to be a clear area. They entered what looked like a thin cirrus cloud at FL 250, and almost immediately encountered heavy rain and hail. Postflight at home revealed dents on the leading edges of each wing, on top of the fuselage and on the vertical stabilizer. Luckily, neither engine was damaged.

* * *

Thunderstorms are often masked by other cloud systems, either by altostratus or a self-generated cirrus shield. Large, isolated thunderstorms, typical of our middle west, and frontal or squall-line thunderstorms will sometimes generate a large cirrus shield which may extend as much as 100 miles ahead of the thunderstorm itself.

Even maintaining VMC, however, is no guarantee against hail damage. Due to winds aloft or vertical wind shear, hail may be found in clear air well away from the thunderstorm cloud.

* * *

The C-141's airborne radar failed on one leg of a long trip. The radar was written up and, after the aircraft landed at an intermediate stop, transient maintenance took a look and informed ACP that the radar couldn't be repaired at that station. The outbound crew checked weather shortly before scheduled takeoff and received a weather briefing which did not forecast thunderstorms enroute. A delay held them on the ground nearly an hour longer than scheduled, but no attempt was made to update the weather briefing. Three hours after the weather

briefing, the crew observed a line of cumulus buildups—some towering as high as 50,000 feet—stretching across their path of flight. They entered a "cirrus cloud" as they approached the line and, before they could extricate themselves, received hail damage to the leading edges of wings and pylons, the HF antenna probe, the radome and to three engine dome assemblies.

There were several stepping stones along this particular primrose path:

1. The forecaster didn't provide a forecast for isolated thunderstorms, even though there was a possibility of their development.

2. The radar specialist who looked at the radar didn't use applicable tech data and incorrectly diagnosed the radar malfunction; the radar could have been—and should have been—repaired before the aircraft was launched.

3. The pilot elected to penetrate a cirrus cloud condition, without radar, in an area of identifiable cumulonimbus buildups.

* * *

Thunderstorms have always presented a major hazard to flight. Statistically, turbulence is the biggest offender, followed closely by hail, with lightning a distant third. See and avoid is clearly the best way to deal with thunderstorms, but isn't always possible. As we continue to expand our global, all-weather mission, the need for more information on thunderstorms becomes more critical.



To this end, a cooperative research program involving the USAF, NASA, the FAA, the Canadian National Research Council, the British Royal Aircraft Establishment, and the National Severe Storms Laboratory of the National Oceanic and Atmospheric Administration has been operating in Oklahoma. In support of this program, test aircraft have been making controlled flights into thunderstorms of varying intensities. Their goal has been to determine the distribution of the hazards and how well that distribution correlates with *indirect* probing, such as radar. As a result of this testing, indications are that radar, properly used and interpreted, is the best source of hazard distribution information now available.

The Oklahoma tests came up with other data of vital importance to pilots:

- The average diameter of a severe thunderstorm is 10 to 15 miles. *Severe turbulence can be encountered even near the edge of the visible cloud.*

- At lower levels, around squall lines and thunderstorms, the return reflected on ground weather radar may not be sufficient for avoidance of severe turbulence unless the aircraft is maneuvered to avoid all radar echo by *well over five miles.*

- Hail, unlike turbulence, can *usually* be pinpointed by strong echo centers.

CAN YOU TELL BY LOOKING? One experiment was conducted to see if the visual appearance of the cloud could be used as a reliable indicator of the turbulence inside. The answer is no; as a rule, pilots couldn't estimate turbulence with any accuracy prior to penetration. Radar returns, however, provided a very useful prediction. Radar echo is a good indication of rain intensity, which in turn, is a useful indicator of severity of turbulence.

Farmers like to tell you, "if you don't like the weather, wait a minute—it'll change." Thunderstorms can change in character very quickly. Thunderstorm building in excess of 6,000 feet per minute isn't unusual, and turbulence within the storm can go from light/moderate to severe in a matter of minutes.

The weather forecaster does a remarkable job of changing raw data into a useful tool, but forecasts are a long ways from infallible yet, and there are many other tools available to the flyer.

- If you can see buildups, avoid them if at all possible.

- If you have radar, use it.

- If ground radar is available for weather vectors, use it.

- Take the time to update weather information, with revalidation in the event of a delay or with METRO enroute.

- If you run into something significant, report it. Weather forecasters and other pilots will find this very useful.

There is no known instance of a thunderstorm coming out second best in a contest with an airplane. Stay flexible and have enough sense ★

THE I.P.I.S. APPROACH

By the USAF Instrument Pilot Instructor School, (ATC) Randolph AFB, Texas

SID CLIMB RATES

Q Will adherence to SID minimum climb rates assure compliance with ATC altitude requirements?

A Not always. When a climb gradient in excess of 150 feet per nautical mile is required on a SID, it is published as a required vertical velocity. This published climb rate is determined solely for obstacle clearance requirements. ATC altitude requirements along the SID flight path may require climb rates considerably higher than those published.

MISSED APPROACH POINTS

Recent inquiries concerning the missed approach points for various approaches would indicate that more than just isolated confusion exists on this subject.

PAR/ILS: The missed approach point (MAP) for precision approaches is the geographic point where the glideslope intersects the decision height. For a PAR approach, decision height is determined in the cockpit either as read on the altimeter or as observed by the radar controller, whichever occurs first.

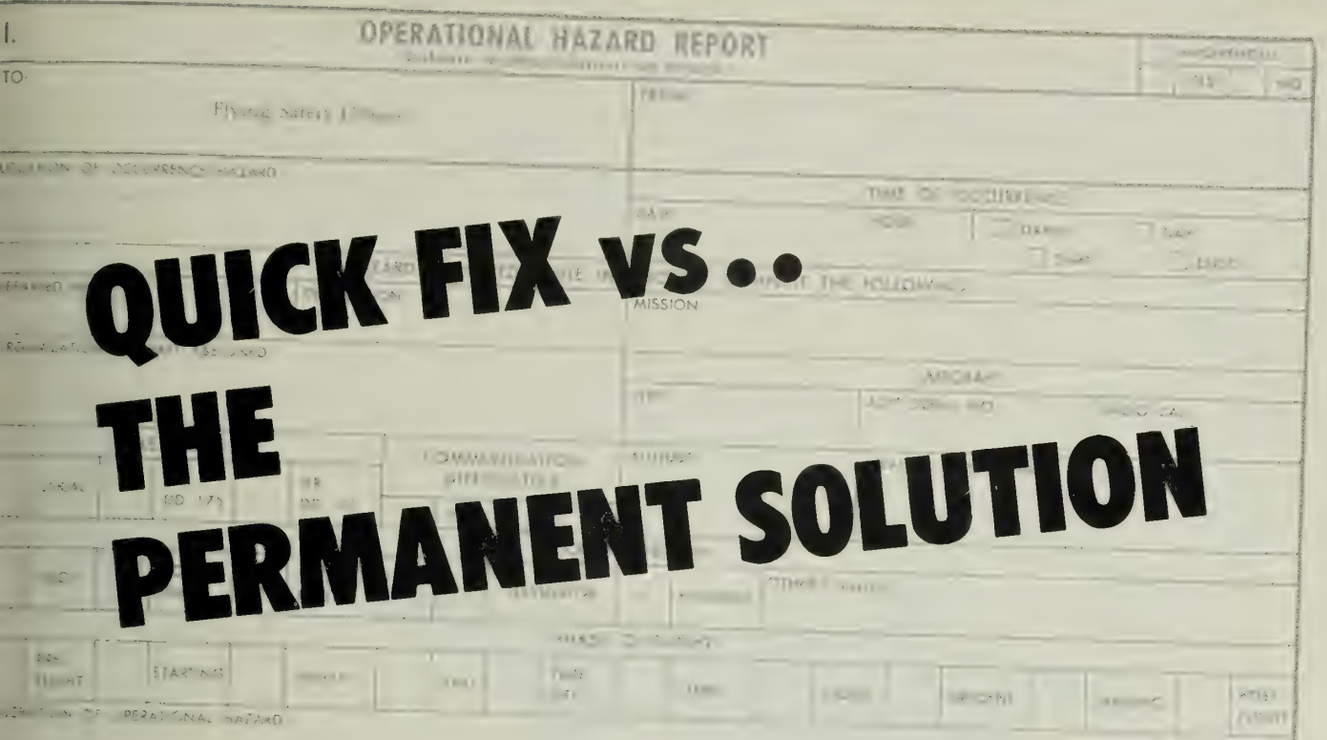
The MAP for an ILS approach will normally be very close to the middle marker if one is installed. In some cases, however, there is a considerable distance between the two. For this reason, the middle marker should be used only as a reminder that you are very near the MAP. Determination of the MAP is made solely with reference to the altimeter and glideslope indicator.

ASR: The radar controller is required to discontinue approach guidance when the aircraft is at the MAP or one mile from the runway, whichever is greater. From the pilot's standpoint, perform the missed approach whenever the controller instructs you to do so. This will be no less than one mile from the runway.

LOCALIZER: The MAP for a localizer approach is not necessarily the same as for the corresponding ILS approach. The depiction on the approach chart supports the ILS and not the localizer procedure. The timing table, when included, will show the distance from the LOC final approach fix to the MAP. For most approaches this distance is to the threshold of the runway. The common method of determining the MAP is by timing from the final approach fix, though other methods may be used (DME, middle marker, etc.).

OTHER NON-PRECISION: The MAP for all other non-precision approaches is as depicted on the approach chart. If the procedure has a final approach fix, the MAP may be well short of the runway threshold or at the runway threshold. For on-airport facilities (VOR or NDB) which do not have a final approach fix, the facility itself is the MAP and in most cases is past the runway threshold.

It is erroneous to assume that you will be in a position to make a normal landing if you reach MDA and the MAP simultaneously. When the MAP is at or beyond the runway threshold, you must reach MDA *prior* to arrival at the MAP if a normal final approach is to be made. ★



QUICK FIX vs.. THE PERMANENT SOLUTION

MAJOR R. M. MAC INTOSH, 7AF (SEF), APO San Francisco 96307

Each of us has encountered unsatisfactory situations that were easier to overlook than to correct. A tragic example was when a transport crew, flying in VFR conditions, recognized an altitude error in terrain clearance on the published SID. During the course of their flight the discrepancy was forgotten. Fate had her way when, in IFR conditions, another transport following the SID slammed into the mountain fatally injuring all aboard.

You have a responsibility to inform your commander of potential hazards and you have a most effective tool at your disposal. It's the AF Form 457, better known as the OHR (Operational Hazard Report). In the above case, a radio call followed by an OHR might have prevented an aircraft accident and saved a great number of lives.

Frequently, when we suggest to a newmember or maintenance man that an OHR be submitted, there is a great reluctance to initiate the process. Why? The most frequently heard statement is, "Any supervisor worth his salt can solve an OHR problem in 15 minutes with a phone call or a few strokes of the pen. Why get involved in all the paperwork?"

There are some very valid reasons why! If that "salty" supervisor is on leave or TDY, the problem may develop into an accident before he gets back. OHR actions are suspense items and should get the necessary action on the problem whether "Salty" is around or not.

If the problem is solved with a phone call or a buck slip, the conditions may be corrected today but the underlying cause may have been overlooked. OHR solutions are staff efforts. Cursory measures don't get by responsible supervisors. Your OHR and the solution will be reviewed by higher echelon supervisors—the DCO, DM or Wing Commander generally review OHR action to insure adequacy.

Also, you get a return copy when the action is complete. If the problem was misunderstood or the fix inappropriate, you will know that followup is in order. Don't hesitate to send the matter back for reappraisal.

Even if a problem can't be eliminated or corrected, your efforts will have focused supervisory attention on the situation. Frequently, general awareness of hazardous situations is sufficient to preclude an accident. You have the opportunity to initiate the sequence that will create that awareness. ★

(COMBAT SAFETY)

Airborne Smokey



stay out of his way

There's something magnetic about a big forest fire. It draws hundreds of spectators and a lot of firefighters. Something else it draws is a whole bunch of airplanes. You don't think about it too much, but the low altitude traffic pattern around a big fire is really congested. In short, the Forest Service has its own Air Force. Every year these old converted aircraft (B-17s, PBYs, TBMs, F-7Fs, etc.) drop literally millions of gallons of fire retardant. In the State of California last year, four million plus gallons were dropped on state fires alone. This represents a lot of sorties since the biggest air tanker (B-17) hauls 2000 gallons. What we are saying is that any time you see a large forest fire, you can bet there is a lot of air traffic in the immediate area.

So the question is, what does this have to do with the Air Force? We assumed not too much until the Forest Service appealed to us for help with a problem which does exist. It seems that some of the spectators who are drawn to the big fires are riding in military aircraft. They cited one particular instance where a fighter flew right in front of a B-17 on its drop run, through the smoke, and performed an abrupt pull-up right in the path of another fire bird waiting his turn in the pattern. Since this type of operation is dangerous enough for the fire bombers, they would like to reduce the midair collision problem as much as possible. The avoidance of a midair is a problem even when their own birds are in the area without compounding it with a strange, uninvited flying machine.

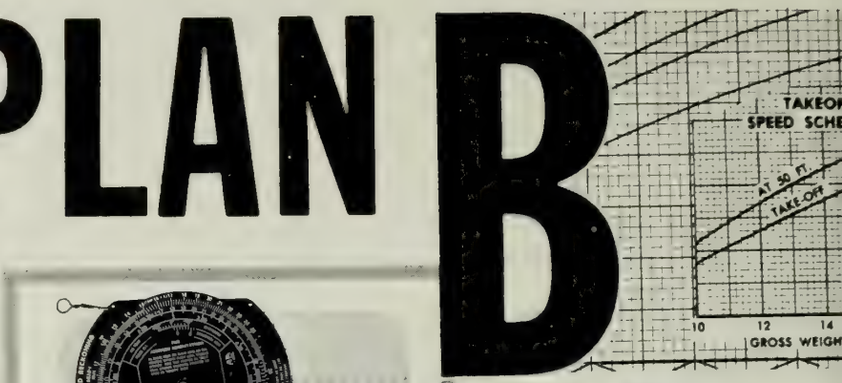
Another major area of concern is aero club members. All managers should insure that the pilots who fly our light birds are well aware of the dangers of flying in the vicinity of large ground fires. It's a temptation to "just fly by" and see how things are going, especially when you're in a light, low altitude bird.

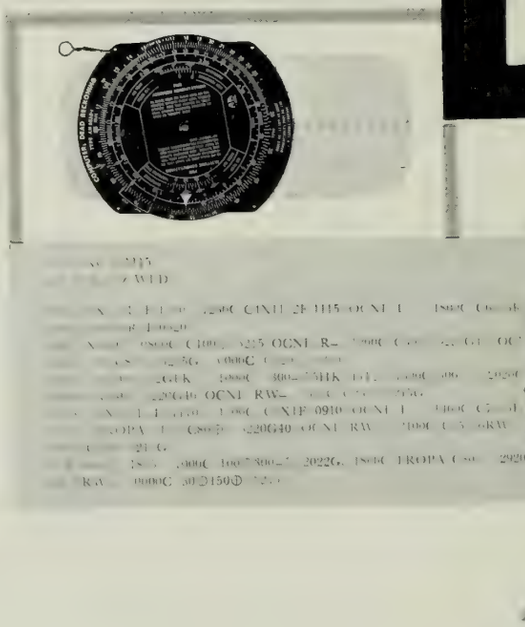
We know that almost all of our Air Force missions are so closely planned that it is unlikely that mission requirement would allow time for such sight-seeing. For the few who do have time, make sure you don't become a statistic by colliding with a World War II vintage B-17 while surveying the fire situation. ★



• Not a WWII raid—a B-17 dropping 2000 gallons of fire suppressant in a burning forest.

PLAN B







One of the neatest things about the human mind is that it has the ability to adapt to changing conditions. But like mechanical computers, it will not function unless we tell it to. In other words, we have to keep thinking or we can find ourselves up the creek without a paddle. In this case, let's call the paddle Plan B. Most of us recognize the need for an alternate way to get where we want to go, but sometimes our computer doesn't spell this out because we fail to tell it to spit out a solution.

When we plan a cross country, or any flight for that matter, we are required to select a suitable alternate if the weather is below a certain value. However, one thing that is not spelled out in the regs is a *unique* situation. Let's say, for example, that we are planning to land at a high density training base with one runway. If someone slides to a halt minus the gear about the time you arrive there, what's your alternate? Do you have *something* in mind?

Another one of these Plan B situations occurs about the time you break ground in a single-engine fighter, and the engine catches fire. What now? Did you consider this possibility? We know one pilot who swears that before brake release on

THE T.O. WAY IS A.O.K.







every mission he considers what his alternate plan of action is if the motor stops or he loses thrust. We believe him. We are also relatively sure that if he ever does have an emergency on the takeoff roll, his chances are much better than those of the pilot who ignores the possibility and refuses to consider what he would do.

Hangar flying certainly has its place in helping us formulate our own personal Plan B. Has anyone ever listened to a hairy story related by some other pilot, who hasn't asked himself what he would have done if faced with the same set of circumstances? After many years of listening to these remote frustrations, most of us tend to formulate a course of action to solve a particular pet problem. With some pilots it's weather, others fear midairs or the embarrassing classic of too little fuel and too many miles left to go. What we must do is consider *all* the combinations of problems that are likely to arise *and* at least a tentative course of action.

Nor is this need for an alternate plan limited to the guys who drive airplanes. Remember the one years ago where the crew chief was running up a C-46? Unfortunately the beast jumped the chocks (perhaps the brakes were not set). Again, unfortunately, the crew chief was not qualified to perform the run up. He panicked and leaped out of the aircraft without any effort to stop the bird. Before this one was over, several airplanes were destroyed and several lifeless bodies were strewn around the ramp. What was this man's alternate course? He probably didn't have one because he was not familiar enough with emergency procedures. **Rule:** if you can't predetermine a way out of a possible sticky situation, chances are you are going to end up a very sorry guy.

We all know how routine it is to see the familiar fire guard handy when we crank engines. Have you ever wondered if the fellow really knows what to do with that piece of equipment, if the time comes? We know of one that was eager but just didn't have the training. A jet caught fire but the fire guard *didn't know where to aim the nozzle on the extinguisher*. Result, one burned up airplane.

How about the one where the fire truck was responding to an off-base crash? During this effort the driver managed to get on an access road that had been closed months before and found himself, truck *et al,* at the bottom of a big ditch. Someone had failed to determine a substitute route and update the accident response plan.

Does one of your duties involve taxiing airplanes? What happens if the brakes fail? Do you shut the motor(s) off? That just might not be the best course of action since, when the T wheel stops going around, you usually find yourself without hydraulic pressure. Without this nice feature, you end up strapped to a very large unguided tricycle. It might be worth a few minutes of preplanning to determine just what you would do.

Naturally, we can't come up with a course of action for every situation. However, in most cases we can think of the one that can do us the most harm and compute a Plan B. A pilot doesn't have an alternate for every mile of his cross country, but he should be familiar enough with the track that he knows in general terms where he can go if an emergency arises. What this all boils down to is that you have to be AWARE. Know where you are and don't daydream until time comes for some rapid action and discover the computer reads empty. The more pre-planning you do the less grief you will suffer. ★



COCKPIT FOD

The T-38 lined up on the end of the runway for a dual transition flight. As it accelerated through rotation speed, the student pilot began to apply back pressure on the stick to rotate. The stick would not move aft far enough to raise the nose, so the student retarded the throttles and aborted takeoff.

The instructor pilot, believing the student was using improper throttle technique, returned the throttles to the afterburner position. The student immediately informed the instructor pilot of the rotation problem. The IP now realized the situation and aborted takeoff. The T-38A made a successful barrier engagement and sustained only minor damage.

A postflight investigation revealed a 2½ inch paper clip lying on top of the stick well boot in the front cockpit. The paper clip was of the type that is occasionally used by pilots to clip checklists and flight data cards to their flight suits.

The paper clip was bent in a manner that could have resulted from binding between the control stick and the stick well boot mount. Several half-moon cuts were found in the stick well boot, and the paper clip limited aft stick travel when it was aligned with the cuts in the boot.

Fortunately, this extra bit of foreign material revealed its presence before the aircraft became airborne. Otherwise it could easily have caused a major accident. Cockpit FOD can be as dangerous as engine FOD.

THE CARE AND FEEDING OF NOMEX GEAR

• *Coverall, Type CWU-27/P:* This coverall fabric is a drip-dry type requiring no special handling and may be washed as frequently as needed. The coverall may be laundered at home or in a commercial type washer and dryer. Laundering in water up to 140°F maximum, and tumble drying up to 180°F, will not damage or shrink the coverall. Since the coverall fabric is a high-temperature resistant material, ironing or pressing will not remove the wrinkles and creases. It is recommended that immediately after tumble drying or during drip drying, the coverall be hung on a hanger. Laundering will not compromise the flame retardant



properties of NOMEX and no renewable flame retardant treatment is required. (NOTE): It is recommended that a new coverall be laundered prior to use in order to soften the fabric and eliminate any possible skin irritation that might occur due to original fabric harshness.

• *Flight Gloves:* The leather portion of the glove is launderable and the fabric portion is a drip-dry type. The gloves may be laundered with warm water and mild soap by one of the following methods: (a) Don the gloves and wash with soap and water as you would wash your hands. When gloves appear clean, rinse, and remove from hands. Squeeze, but do not wring or twist gloves to remove excess water. After removing excess water, place individual glove flat on a towel, roll towel to cover glove making sure that the gloves do not come in contact with each other. (b) The gloves may also be laundered at home or in a commercial type washer and dryer. Laundering in water up to 140°F maximum and tumble drying up to 180°F will not damage or shrink the glove. (NOTE): Do not use any type of bleaching compound in laundering. To avoid excess wear on the gloves during washing and drying make sure there are sufficient articles in the wash to absorb tumbling shock.

(AFSC Safety Management Newsletter)

TOPICS

HOW CLOSE CAN YOU COME?

The mission was contact transition, the new pilot's third ride in a Century-series fighter; he and the IP had stayed in the pattern, shooting touch-and-go landings. On the third approach the student's base turn was low, but the IP's attention was diverted by another aircraft making a low approach a half-mile ahead of them. The IP's attention was recaptured quickly when Mobile called and told them to "bring it up to the runway," whereupon the IP took control of the aircraft and added power.

At this time the aircraft flew into the vortex turbulence of the aircraft in front and settled slightly, striking a 50-foot power line 2000 feet from the runway threshold. The IP went to burner and climbed back to a safe altitude, but a look around the cockpit disclosed an unsafe nosegear indication. The pilot of another aircraft in the pattern took a look and confirmed the nosegear door was damaged and the nosegear itself was retracted about 45 degrees back, against the nosegear door.

The IP made the final landing from the rear seat, touching on the main gear, deploying the drag chute and holding the nose off as long as possible. When he did lower the nose, the aircraft settled gently on the pitot boom and ground to a stop. The crew shut down the engine and egressed with no difficulties.

This turned out to be an incident—damage was minor and no one was hurt—but how close can you come?

ILLEGAL CARGO

A recent message to all commands from the Chief of Staff underscores the ever-increasing emphasis on stemming traffic in illicit drugs. According to the message, one of the most frequent hiding places for narcotics is a small, innocent-looking package being transported by someone as a personal favor for someone else. Aircrew members are particularly susceptible to being singled out for this kind of "favor."

The person caught with the contraband is responsible for the contents of the package, whether he is aware of the contents or not, and is subject to disciplinary action. Don't accept a package from anyone, particularly in an overseas location, unless you have *first-hand knowledge* of the contents and you are willing to accept any possible consequences.

FLIP CHANGES

New DOD International Flight Plan, DD Form 1801:

A new DOD International Flight Plan, DD Form 1801, is now available. All military pilots are authorized to use it in place of the ICAO Flight Plan.

Instructions for the use of DD Form 1801 will be published in the FLIP Planning Documents. In the interim, pilots should use the instructions applicable to the ICAO Flight Plan in Section III, FLIP Planning.

The locally produced ICAO Flight Plan may be used when DD Form 1801 is not available, or in order to deplete current inventory.

HEADS UP--VISORS DOWN

It happened on the gunnery range. The F-4 crew had completed four 10-degree low angle strafing passes. During recovery from the fourth pass, the right windscreen panel was broken—probably by a .20mm ball. A hole approximately one inch wide and seven inches long resulted from the impact. The object did not enter the cockpit; however, several pieces of plexiglas were blown into the front cockpit. Minimum altitude and cease-fire ranges were not violated.

The important thing here is that both crewmembers had their helmet visors down. We trust these words will serve as a reminder for all aircrews to wear the visor down during all low-altitude flight to prevent injury in case the canopy is broken by ordnance debris, birdstrike, etc.

(USN WEEKLY SUMMARY)

Ops topics

NEW POWER LINE WARNING LIGHTS

FAA has officially adopted a new standard for warning aircraft of the presence of power and other transmission lines, by the use of flashing sequenced lights on the supporting structures. The previous standard recommended positioning colored spherical balls on the wires and red tower lights. Pilots may expect to see the older system continued temporarily in some areas, since the standard is not obligatory. Check with AIM and your local FAA facility.

GEAR CHECK

"Left main gear indicated unsafe in up position Recycled gear several times with same indications. Checked good in down and locked position. Landing accomplished without further incident"

SEX! !

Now that we have your attention, we'll say it again: If the gear won't come up, see if it will go back down. If it goes down and safe, land and give the airplane to Maintenance. Do not—repeat, do not—recycle the gear in hopes of continuing the mission. The proper place to troubleshoot a gear malfunction is on the ground, in the hangar, on jacks. Anything else is just asking for trouble.

SURPRISE! !

While setting up for his first strafe pass, the pilot got the surprise of his life when his cannon began to fire. He immediately turned the switch off but 164 rounds fired in that short time. All rounds impacted on the range.

They found a faulty trigger detent switch during trouble-shooting and replaced the stick grip. But they didn't stop there . . . pressing on with the investigation to find out WHY, they found that the wiring for the four-way trim switch was misrouted and pressing against the trigger detent switch, causing a fire signal to be present when the other safeties in the system were removed.

The stick grip had been replaced four months earlier but there was no way to trace the man who did it. So somewhere out there is a man who doesn't know how to route the trim wires in a B-8 stick grip. Little thing? You bet . . . unless he's in your outfit.

(TAC Attack)

FIELD-GRADE FOD

After a heavy-weight landing, due to an inflight abort, the aircraft was taxied back onto the parking stub. Prior to engine shutdown, the Supervisor of Flying, intent on personally making sure that a hot brake problem didn't exist, made a quick check of the wheel area. His flight cap, with insignia, was sucked from between his head and the headband of the "Mickey Mouse" ear protectors he was wearing, through the left engine bottom blow-in door and into the engine.

Jet engines will eat almost anything. We have to be constantly aware of where we are in relation to hazard areas such as engine intakes, engine exhausts, antenna radiation patterns and the like.

WHEN YOU NEED IT, YOU NEED IT NOW

Life support equipment that doesn't function is no better than none at all. Therefore, those responsible for maintaining it must be meticulous in performing their duty. Unfortunately, that is not always the case.

During a recent no-notice Unit Effectiveness Inspection, inspectors found the following deficiencies in the life support section:

- Aircrew helmets had not been inspected and were in poor condition.
- Life preservers and life rafts were not being functionally checked.
- URC-10 and RT-10 survival radio batteries were over age, some as long as 18 months.
- Weight check of the F-4 survival kits had not been accomplished prior to ejection seat installation.
- A tester was not available to perform the 10-day leak test on the oxygen mask connectors.
- The high-pressure regulator required for operation of the oxygen mask tester was inoperative; the condition of aircrew "G" suits was marginal.
- Personnel lowering device hardware was improperly installed in four parachute harnesses.

Aircrews deserve equipment that works, not excuses why it didn't. ★



REX RILEY'S CROSS COUNTRY NOTES

The evaluation of a base by Rex and his helpers is as objective as we can make it. However, because of the very nature of the evaluation we have to be subjective. For example, the facilities may be average but invariably the attitude of the individuals responsible for the services has a definite effect on the rating officer. If the people with whom we come in contact are energetically trying to provide top notch service, it is only natural that the rater will up them a block over base services that have that "don't really care if you get fuel or not" attitude. Nor does Rex consider one isolated complaint as truly representative of the service you can expect. The letters we reproduce and send to various base commanders are intended as a management tool for investigating a problem area. When we receive several complaints about a specific base we put their folder in the "consider for elimination" file.

In almost every instance, the action taken by a base commander in response to complaints will give us a clue as to the quality of transient services available to our traveling aircrew. We recently sent a copy of a complaint to the commander of a large Air Force installation. In less than three weeks we had his reply explaining how the discrepancies happened. We're willing to bet that the next crew that lands at this particular base will get the red carpet service. It's actions like this that tells us that we're making great strides in our Rex program.

Guardian Angel: Now that the thunderstorm season is about at an end I think we can say without reservations that had it not been for those traffic controllers at their scopes on the ground, our ride would have been a lot rougher than it was. Most of our pilots realize that the controllers are by no means required to provide vectors around weather, but we have found that if they are not completely snowed with traffic they are more than willing to help. In fact, to get me an up-to-date report, on a number of occasions they have put me on a frequency with another aircraft that had just flown through the area we were concerned about. So thanks, fellows, for a job well done.

In an effort to improve transient services world-wide, overseas commands have been asked to place increased emphasis on the Rex award. So, if you have a complaint or compliment, don't think that just because you are out of the country your comments won't get attention. Let us know here at Norton or contact your local Chief of Safety. ★

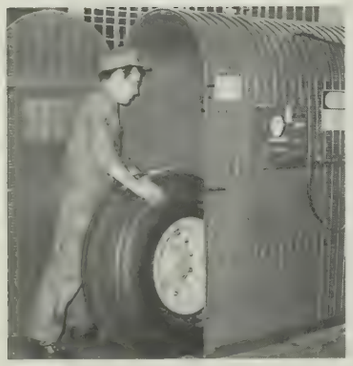


REX RILEY
Transient Services Award

LORING AFB	Limestone, Me.
McCLELLAN AFB	Sacramento, Calif.
MAXWELL AFB	Montgomery, Ala.
HAMILTON AFB	Ignacio, Calif.
SCOTT AFB	Belleville, Ill.
RAMEY AFB	Puerto Rico
McCHORD AFB	Tacoma, Wash.
MYRTLE BEACH AFB	Myrtle Beach, S.C.
EGLIN AFB	Valparaiso, Fla.
FORBES AFB	Topeka, Kans.
MATHER AFB	Sacramento, Calif.
LAJES FIELD	Azores
SHEPPARD AFB	Wichita Falls, Tex.
MARCH AFB	Riverside, Calif.
GRISSOM AFB	Peru, Ind.
CANNON AFB	Clovis, N.M.
LUKE AFB	Phoenix, Ariz.
RANDOLPH AFB	San Antonio, Tex.
ROBINS AFB	Warner Robins, Ga.
TINKER AFB	Oklahoma City, Okla.
HILL AFB	Ogden, Utah
YOKOTA AB	Japan
SEYMOUR JOHNSON AFB	Goldsboro, N.C.
ENGLAND AFB	Alexandria, La.
MISAWA AB	Japan
KADENA AB	Okinawa
ELMENDORF AFB	Alaska
PETERSON FIELD	Colorado Springs, Colo.
RAMSTEIN AB	Germany
SHAW AFB	Sumter, S.C.
LITTLE ROCK AFB	Jacksonville, Ark.
TORREJON AB	Spain
TYNDALL AFB	Panama City, Fla.
OFFUTT AFB	Omaha, Nebr.
ITAZUKE AB	Japan
McCONNELL AFB	Wichita, Kans.
NORTON AFB	San Bernardino, Calif.
BARKSDALE AFB	Shreveport, La.
KIRTLAND AFB	Albuquerque, N.M.
BUCKLEY ANG BASE	Aurora, Colo.

"Everything you always wanted to know about tires...

Tires are something that most of us take more or less for granted. Until, that i one fails. Then it gets our attention right away. Tire failures are extreme dangerous, whether on an automobile or an airplane. They frequently resu in costly repairs due to damage caused by flying rubber, explosions in the whe well or wheel damage on the runway. Many times chunks of tire tread have ripp holes in flaps and wings, severed hydraulic lines and kinked gear door braces.

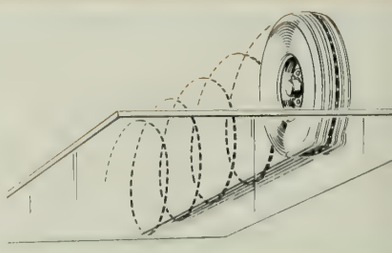


Usually when a tire fails we chalk it up to materiel failure. But how often h this been aggravated by improper inflation and punctures and cuts from foreig material left lying on the concrete? How many tires have been ruined by excessiv taxi speed? How many aircraft have experienced steering problems or seve shimmy because of unequal inflation of dual tires?

We don't all have to be experts on tires, but some general knowledge w help. Pilots should know the hazards of prolonged taxiing on a hot day, or th dangers of making high speed taxi tests on the runway without giving the brak and tires a chance to cool off. Both of these procedures have resulted in blow tires, fires and other damage. A load change frequently means a tire check an change in pressure. But sometimes this is overlooked with serious consequence

Heat is a tire's principal enemy. It is generated by flexing within the ti carcass and by outside heat sources—braking, bearing friction, hot pavement, et Heat builds up in a rolling tire under a heavy load; excessive heat can weake tires to the point of failure. Lower than TO pressure contributes to excessiv flexing which results in heat buildup. Fig 1 illustrates how a tire flexes. Fig 2 show how the footprint should look for various degrees of inflation.

Fig. 1. Flexing action of tire



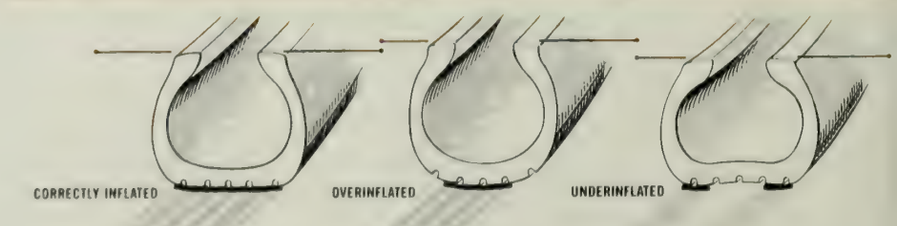
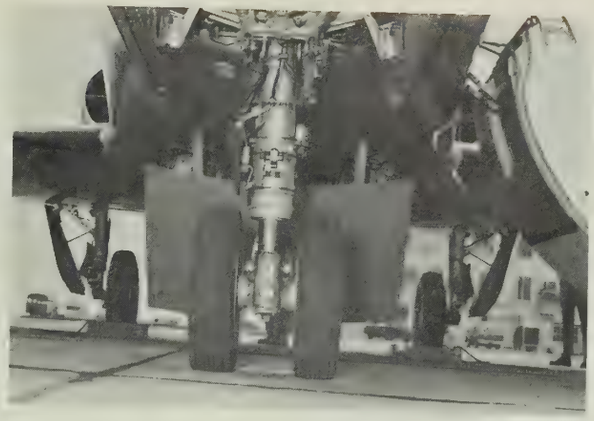


Fig. 2. Footprint area when tire is under load

• Which tire needs air? You can't tell by looking, but the right hand tire is below the TO limit. The only way to really know tire pressure is by use of a properly calibrated tire gage. If not properly inflated, a tire may fail from excessive heat caused by flexing. Tread or ply separation may result, and actual failure may take place on some subsequent flight. Also, underinflated tires can result in hydroplaning at speeds below desired braking speed. Overinflation, as well, is bad since it results in uneven wear and reduced braking coefficient and may even overstress the carcass.





• Checking newly built-up tire for leaks. After mounting, tire should be placed in rack for at least 12 hours, then checked for pressure. Nylon cord will stretch, which will cause pressure loss. The airman here is checking tire for leaks with soap and water solution. With this technique be careful not to get wheel bearing wet, or be sure to carefully dry bearing if it does get wet.

• Carefully inspect tires for cuts, uneven wear, FOD, punctures that might have penetrated cord body and inner liner. Check entire surface including tread, sidewalls. Inspect wheels.





• Next to heat, foreign objects ruin more tires than anything else. This photo shows tire that has been condemned because of FOD. Note screw in face of tread and wire protruding from sidewall (lower right hand corner).

TIRES

• Tire mounting requires great care if damage to tire and wheel is to be avoided. Wheel must be free of scratches, gouges, tool marks. Wheel should be clean—so that proper inspection can be made and to prevent improper bead seating. Wheel preparation is particularly important. Bolts and screws must be in good condition. Look for deformed packing that could mean air leaks. In this photo bolts are being torqued to tech order value in locally built fixture. Proper torquing will assure good seal of preformed packings.

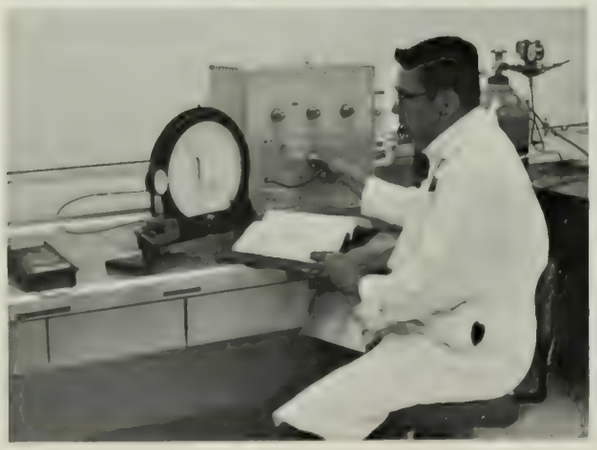




• In addition to visual inspection, wheels should receive NDI to detect minute cracks that could lead to air pressure loss or wheel failure.

• Pressure check is probably most important item in tire care program. Gage should be calibrated frequently. When tire requires service, do not use high pressure source. Overinflation may result in wheel rupture that could cause serious injury to persons in the area, or even death. Normally the best time to check pressure is during preflight when tire is cool.





• An important man in tire care program is the technician in PMEL. Proper calibration of tire gages is essential to good tire maintenance. ★



Toots

is interested in your problems. She spends her time researching questions about Tech Orders and directives. Write her c/o Editor (IGDSEA), Dep IG for Insp & Safety, Norton AFB CA 92409

Dear Toots

As a Maintenance Officer I am empowered by TO 00-20-1 to downgrade a red X condition in the 781 forms. I cannot find a reference confirming or denying the legality of a Maintenance Officer signing off the Inspected By block of the 781A after corrective action has been taken for a discrepancy that warrants a red X symbol. What do the authors of the 00-20 series TOs say?

Don
APO 09406

Dear Don

To answer your question, the OPR for the 00-20 series tech orders referenced 00-20-1, para 3-10. This paragraph states that the repairs made or work accomplished to remedy the dangerous condition indicated by a red X or a circled red X will be inspected by the inspector or supervisory maintenance personnel who are delegated such authority by the maintenance officer. The maintenance officer is a maintenance supervisor, and obviously, in order to delegate the authority, he must have it in the first place.

Realize, however, that the maintenance officer is not usually technically competent to perform these inspections, and it was never intended that he actually inspect and verify the condition of maintenance performed. Rather, he should assure himself that quality maintenance is performed through close supervision and application of sound management principles. As the responsible maintenance manager, the maintenance officer ensures that only the most technically qualified personnel perform the inspections and that they keep him advised of the quality of maintenance actions.

Toots

Dear Toots

I am writing in regards to your column in the June 1971 issue. The letter from "Concerned" at Kirtland AFB and your reply, based on information from the OPR at AFSC Headquarters are both somewhat in error. Only certain AFSC aircraft are included in Table III, Excepted Aircraft, of TO 00-25-4—A-7, B-52, B-66, F-4, F-100, F/YF-104, F-105, F-106, and F/FB-111. All other AFSC aircraft are subject to IRAN just as for any other Major Air Command.

Col A. R. Neville, Jr
Chairman, Maintenance Requirements Review Bd, AFLC
Wright-Patterson AFB Ohio

Dear Colonel Neville

You're right. Thanks a lot for clearing it up.

Toots

Dear Toots

The Dash 2 for the F-106A gives two methods for removing the elevon control valves: during engine removal or through the side access panels. I've seen it done both ways. My question is: What is a Normal Operation? Here at Tyndall we change them through access panels with engine installed, even time changes during HPOs. I have noticed other '106 squadrons on TDY here change them with the engine removed.

SSgt Virgle F. Nelson
Tyndall AFB, Fla.

Dear Virg

I went to MMCT at SAAMA, Kelly Air Force Base, for the answer to your question. They say that Normal Operation would be when the valve is due a time change or is to be removed and replaced for other reasons and is scheduled during other scheduled maintenance, such as engine change, periodic maintenance, etc. They say that the chief of maintenance should dictate policy whether or not to change the valve through the access panel.

Toots

TECH TOPICS

briefs for maintenance techs

IMPROPER MAINTENANCE

After takeoff for an FCF the T-38 pilot felt a thump when he came out of AB. All instruments were normal so the mission was continued, but during straight and level acceleration the left fire light illuminated. The throttle was retarded to idle but the light remained on. The engine was shut down and the light went out in approximately three seconds. Return to base and a single engine landing were accomplished without further incident.

Approximately one-third of the AB liner section had torn and separated from the aircraft. The forward AB liner section, extension liner and outer casing were damaged. Two burn holes were found in the bottom of the boattail.

A review of the aircraft records indicated that this was the second flight following periodic. Investigation of the recovered AB section showed that maintenance had failed to insert five of the liner support rods during buildup. This improper installation caused the unsupported section of the liner to separate during AB operation.

Follow the TO step-by-step during all maintenance and inspection activity.

T-38 GEAR BOX COUPLING

Improper installation of the power shaft retaining ring (P/N N5002-237) caused the power shaft to come disconnected from the gear box coupling. After a few minutes of flight and complete loss of hydraulic and electrical power on the left engine, the engine was shut down and a landing was accomplished without further incident.

Proper installation is critical during gear box and drive shaft assembly. There is no substitute for a perfect job.

STUCK THROTTLE

Takeoff was normal until the pilot of the F-4 attempted to retard the throttles out of afterburner at 300 KIAS. The Nr 1 throttle retarded normally but the

Nr 2 throttle stuck in full afterburner.

After 15 minutes of flight, gross weight was reduced and the engine was shut down with the master switch. When the landing gear was lowered, the Nr 2 throttle became free.

The crew chief had failed to properly secure the starter cartridge breech cap on preflight and it was loose in the auxiliary air door area. When the auxiliary air door closed, after gear retraction, the breech cap jammed against the throttle linkage. When the gear was lowered, the auxiliary air door opened, freeing the breech and throttle linkage.

LOOSE CONNECTORS

After dumping fuel due to a mission change, the C-130 crew noticed fuel leaking from the rear of Nr 2 nacelle. The engine was shut down and return to base was uneventful.

Investigation revealed loose connectors on the fuel dump manifold in both Nr 2 and Nr 3 dry bays, allowing fuel to leak during dumping operations. The connectors had apparently not been properly torqued.

T-38 MISSING PANEL

Postflight inspection revealed the loss of the hydraulic filter access panel during the first flight following a 100 hour inspection. The reason: only three Camloc fasteners on the leading edge had been secured. Small pieces of the panel were still attached at these points, indicating rapid cyclic fatigue (flutter) during flight.

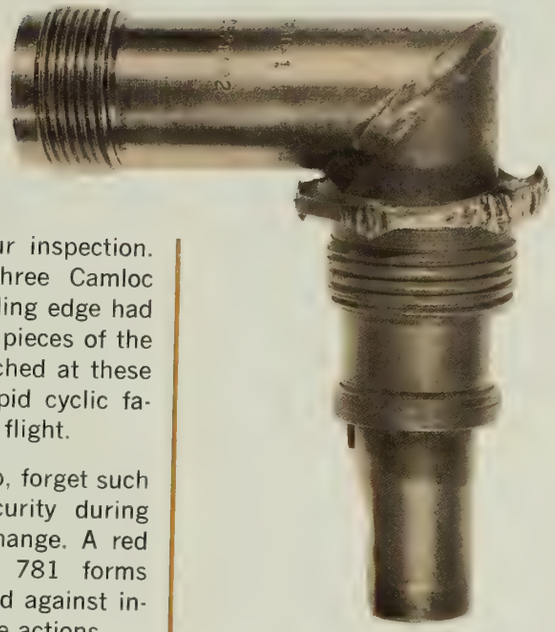
People can, and do, forget such things as panel security during personnel or shift change. A red cross entry in the 781 forms should be a safeguard against incomplete maintenance actions.

HOSE TOO LONG

An inflight utility failure on an F-100 was reason enough for a straight in approach. At touchdown the pressure was indicating zero. Directional control was maintained with the rudder and brakes.

With 2300 feet of runway remaining the brakes failed and the arresting hook was lowered. The aircraft drifted left, passed over the barrier tape and failed to engage. It knocked down a VASI fixture, rolled over the barrier tunnel and stopped with its nose gear collapsed in a small drainage ditch.

The cause: maintenance personnel had installed a 26 inch brake flex hose instead of the original 22 inch. The excessive length allowed chafing with the wheel bolt studs and subsequent failure.



WRONG TOOL MAKES WASTE

Sixty-five dollars was the tab for using the wrong tool. That's the cost of the new igniter plug to replace the one shown.

It's a perfectly good plug for its intended purpose—it'll fire every time—except for one thing: The sleeve nut has been so badly damaged with a pipe wrench or channel locks or vise grips that the plug can't be reinstalled.

A special torque adapter, P/N 1C5064P01, is available, the use of which will prevent this kind of damage. It slides over and around the wrenching surfaces to prevent distortion, and eliminates the apparent necessity for a pipe wrench, too.

(GE Jet Service News)

MEMORY LANE

During climbout on a routine training mission, the pilot of a

MORE

TECH TOPICS

T-29 noticed fuel pressure decreasing on Nr 2 engine. The boost pump was switched off, then back on with no effect on the decreasing pressure. The engine was shut down when the pressure decreased to 21.5 psi, and a single-engine return to base was accomplished.

Investigation revealed that the engine-driven fuel pump balance and drain lines were reversed. The lines had been installed during maintenance on the fuel system prior to this flight. The lines were installed and the red cross cleared by qualified personnel. Their only error was that they trusted their memory instead of tech data.

LOST WHEEL

Following an uneventful mission, a B-57 was on final for a second touch and go when the pilot was informed by the tower that something had dropped from the aircraft. The pilot assumed that he had lost a panel or gear door and elected to make a full stop landing.

During the touchdown the right wing dropped and the aircraft started pulling to the right. By maintaining 90 percent RPM on the right engine and holding left brake, the pilot kept the aircraft under control and stopped on the runway.

The problem with directional control after touchdown was evident. The falling object had been the right main wheel. The wheel and tire assembly was recovered, but an extensive search failed to recover the wheel retaining nut and locking pin.

An examination of the axle locking grooves and retaining nut threads failed to show any scoring or shearing type damage, indicating that the retaining nut backed out of its threads without undue force.

The quality control and maintenance section at this organization is being reevaluated to assure that proper maintenance procedures are being followed.

INSTALLED DISCREPANCY

While investigating a J-85-GE-5 engine for a series of flameouts and afterburner blowouts, the maintenance team found one sector of the seventh stage stators installed backwards. With the technical data and in-process inspection checklist available, we wonder just how an incident like this could occur?

How could the maintenance man overlook this error in a critical stage of engine buildup? How could the supervisor have missed it during his in-process inspection? And how could quality control make the same error as the mechanic and supervisor? The TO and manuals won't answer these questions—but they will provide the information needed for correct engine buildup and proper maintenance management.

CHRONOLOGY OF A FAILURE

A tech order does no good if it is simply given lip service. Failure to check every item required by the TO can lead to a situation like the following in which a T-38 rear canopy was lost.

The aircraft rolled out of 200-hour hourly postflight on the 2nd day of the month. The canopies had been installed in accordance with the work cards. On the 6th of the month the rear canopy was written up: "Both balance cables frayed and the canopy out of rig." Corrective action indicated that the balance cables had been replaced and the canopy rigged.

On the 8th, the star washer was missing from the aft canopy lock push-pull rod assembly. Corrective action: star washer installed. No further rigging accomplished.

Twelve days later the rear canopy was lost during climb as the aircraft passed through 15,000 feet. Cause factor: **canopy out of rig.**

As we review the discrepancies leading up to the canopy loss, we wonder where the TO was during these maintenance actions.

T-33 HOT STARTS

Last year 189 J-33 engines had to be replaced in T-33s when hot starts and other overtemperature conditions occurred. A great deal of time and effort was expended on engine changes that might not have been necessary if everyone had done his job conscientiously.

Although TOs are not specific on wind speeds, any time there is a tailwind there is risk of a hot start. Transient Alert troops can do their part in preventing hot starts by insuring that visiting T-Birds are parked facing into the wind whenever possible.

If your ramp is big enough, why not be flexible and park all tran-

sient aircraft into the wind? T-33 pilots who don't want to spend a few extra days RON would be well advised to insist on starting with a headwind component.

Maj David H. Hook
Canadian Forces
Directorate of Aerospace Safety

A PROPER FIT

A little research by our computer indicates that we lost 121 panels and/or doors in flight during the first six months of 1971. There was one major accident and one aircraft destroyed—an F-106; the pilot lost control and was forced to eject when one speed brake separated from the aircraft. The cause of some panel losses is poor design, of others poor quality workmanship during re-manufacture in our shops. But most are tabbed as failure of maintenance personnel to properly secure them.

Panels should fit flush with the aircraft skin. If the leading edge bulges slightly between fasteners, or if all fasteners are not properly secured it won't withstand high-speed flight. Check the panels or doors every time you install or close them, making sure they fit properly. A panel or door should be either unmistakably open or buttoned up securely.

MUFFED GEAR

The pilot dismounted from the F-100 and was proceeding with the exterior postflight inspection when he noticed the left main gear door missing.

Further investigation turned up a set of ear protectors wrapped around the gear strut. The gear door mount and hinge bracket were broken and the pork chop plate torn. The forward tip of the horizontal stab was bent up.

The cause of this incident was traced to transient maintenance at the departure base. One of their personnel had placed the ear protectors around the strut and failed to remove them. During gear retraction the door jammed against the muffs, failed to close completely and was torn off by the airload.

Protective equipment should be worn as designed or properly stowed to prevent incidents such as this.

CROSSED COWLING

Following a ground run alert exercise the B-52 crew noticed a four-inch hole burned in the Nr 4 engine cowling. The team looked a little further and found the hole was burned directly under the starter exhaust.

It was learned that during routine maintenance, prior to the aircraft being placed on alert status, maintenance personnel had switched the Nr 2 and 4 cowling. (Nr 2 does not have an exhaust port.)

Fortunately the cost to repair this error was only $18.24. Fortunately? Yes, in researching back a few months we find a similar incident in which a KC-135 cowling was installed on the wrong engine. During cartridge start an explosion occurred and the repair bill ran in excess of $12,000.

THINK QUICK

Loss of nose wheel steering and brake failure occurred as the F-4E taxied into the pit refueling area. (It was later determined that the Nr 1 engine utility pump failed.) Nr 2 engine had been shut down as the aircraft approached the refueling area.

The alert pit crew chief, noting that the aircraft was drifting right and that the pilot failed to respond to marshalling signals, realized that the pilot was having difficulty. So he picked up the wheel chocks and threw them in front of the nose gear tires.

The aircraft passed over the chocks but they slowed forward speed.

The F-4 hit a parked aircraft with only minor damage. The pit crew chief's alertness and reaction to an emergency possibly averted a major accident. Nice work!

BOMB RELEASE

The F-4 was enroute to the range and the pilot was setting up the switches for practice weapons delivery. As the left outboard station was selected, the right MK-84L released.

The cause was traced to a bent pin in the left outboard pylon external jumper plug. Pin C was bent and touching Pin B, supplying jettison voltage to the right outboard pylon.

All loading personnel of this organization were subsequently briefed to visually check the serviceability of all connectors before installation. ★

EXPLOSIVES SAFETY

for munitions, weapons, and egress techs

DOUBLE JEOPARDY

GORDON S. TAYLOR,
Directorate of Aerospace Safety

The dictionary defines "jeopardy" as "Exposure to death, loss, or injury." "Double" is defined as "Two-fold; made or being twice as great." In combination the two words define precisely what is occurring all too frequently in the explosives business.

The munitions field has a built-in jeopardy but we try not to unnecessarily expose ourselves, our friends, and our coworkers to known hazards or do we?

At one base, a 20mm round was fired from an aircraft cannon during the gun functional check. That's jeopardy. The investigative and administrative authorities went through all of the regular steps of investigation and reporting. All, that is, except taking immediate corrective action to inform all concerned what happened and how to avoid a similar mishap. Within 24 hours, a second 20mm round was unintentionally fired, again during the gun functional check. That's *double jeopardy*.

At another base, three CBU-24s were knocked off a flatbed trailer when a forklift driver let his vehicle roll while shifting gears. This mess wasn't even cleaned up before a second forklift driver knocked two more CBUs off another trailer at the same operating site by a similar lack of vehicle control.

. . . Still another base. MK6 Mod 3 Signal Flares were ignited on two separate occasions, about six hours apart, when 20mm ammunition being loaded into the gun drum caught and pulled the flare lanyards.

In each case, no actions were taken to see that all concerned with similar operations were immediately informed so that steps could be taken to prevent recurrence. Double jeopardy was knowingly permitted to exist. It's impossible to justify such laxity. If an accident happened once, it can happen again. If you are unfortunate enough to get trapped once—use your smarts, avoid the DOUBLE JEOPARDY! ★



SMUGGLED EXPLOSIVES

An Army Specialist 4 was caught during custom inspection with two blasting caps and six rounds o small arms ammo. What will happen to the USA Sergeant who attempted to bring in two pounds o smokeless powder, two rounds of carbine ammunitio and 35 rounds of .22-250 commercial cartridges? The there was the Marine who had certified that his luggag was free of firearms and explosives only to be caug with guns, ammunition, flares and signals.

These are but three of an increasing number of inc dents involving the attempted illegal transportation explosives. Additionally, personnel confronted with im pending customs inspection have irresponsibly di carded numerous explosives items in air terminals. The ranged from small arms ammunition, dynamite an demolition charges to 81 mm mortar shells.

Thus the lives of innocent personnel, including d pendents, plus aircraft and facilities have been placed serious jeopardy. Surely it's not worth the risk to b these lives against a soon-to-be-forgotten souvenir.

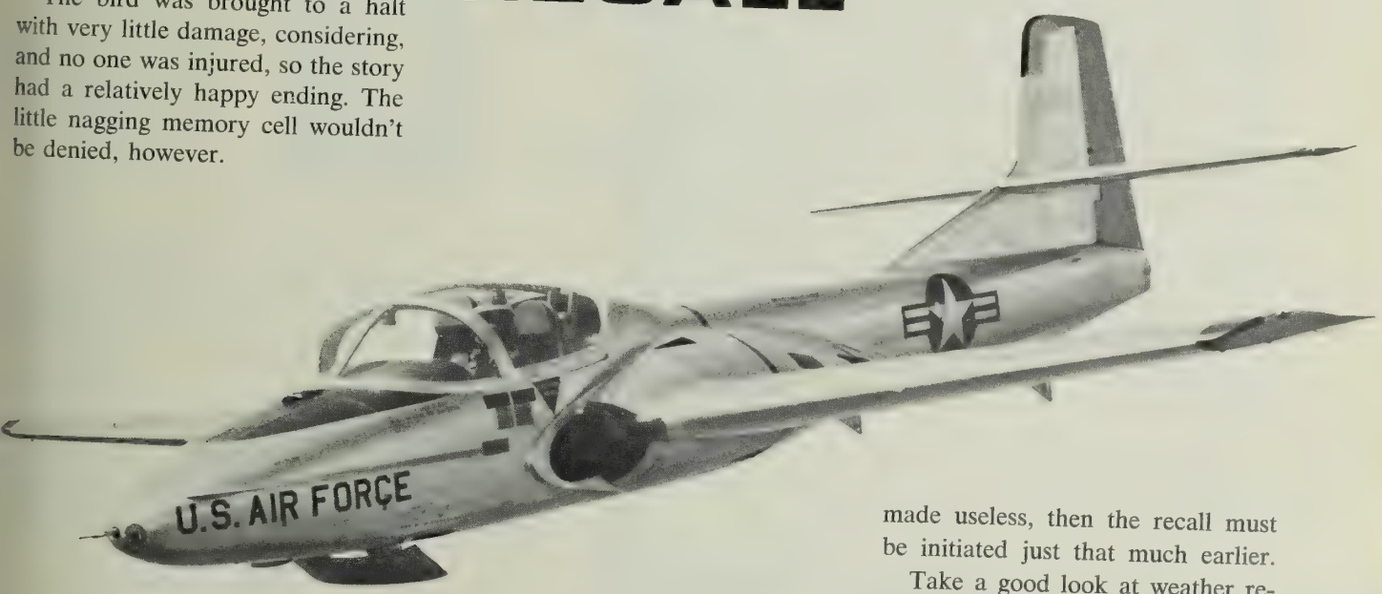
Your best bet is to leave explosives where the belong. If you don't, it's an odds-on bet that you'll fa the judge and land in stripe city. Then there's alwa the chance that you will lose the works and it may b your last bet. ★

Weather RECALL

The message jogged a dormant memory cell back in the dark, damp recesses. It was an incident report about a student pilot, out solo when the winds very abruptly increased in velocity and swung to crosswind, resulting in a weather recall. There were no dual aircraft airborne with sufficient fuel to accompany this student to a suitable alternate, and the senior controller decided to have the student land immediately—even though the aircraft was heavy.

The student touched down 1000 feet down the runway at 155 knots. He began what he thought was optimum braking at 140 knots, but ran out of runway and took the barrier at approximately 50 knots. Unfortunately, the barrier cable was deflected down by the IFF antenna and rotating beacon and missed the main gear. The webbing wrapped around the nose gear, cocking it 90 degrees, and the aircraft departed the overrun and headed off over the desert, still dragging the barrier webbing.

The bird was brought to a halt with very little damage, considering, and no one was injured, so the story had a relatively happy ending. The little nagging memory cell wouldn't be denied, however.



A call to the base where it happened supplied some additional information, which supported the senior controller's decision: The controller got the student on the ground before the winds went past the crosswind limitation for solo students; a few minutes later the winds got appreciably worse, and stayed that way the rest of the day.

FLASHBACK: Circling VFR in bright sunlight, eyeing the ugly black cloud several miles away that marks the precise center of Last Chance Air Patch. The radio is squawking, *"Attention all Last Chance aircraft, weather recall is in effect, return to Last Chance and land."* The voice is hard to understand through the thunder in the background. The pilot looks at the nice weather where he is and compares it with the big murky spot where the voice wants him to go. He looks with satisfaction on the three hours of fuel he has left, mutters under his breath, "No way, buddy," and turns down the volume on the company radio.

Twenty minutes later, the black cloud having moved eastward, the pilot brings his bird into the pattern of the wet, sunlit airfield, gracefully deposits it on the runway, taxies in and shuts down, shaking his head at the philosophy that tried to get him there twenty minutes earlier. END OF FLASHBACK.

What's the purpose of a weather recall, anyway? It's certainly not intended to give the pilot experience in the worst possible weather. Ideally, the forecaster will be able to give a good indication of when operation might be threatened. PIREPs throughout the day should enable Ops and Weather to judge a deteriorating situation pretty closely. And the weather recall should be initiated early enough to get all the birds down safe BEFORE the weather becomes a problem.

A key part of any weather recall plan should be a weather divert plan. Most bases can find an alternate, comfortably close, where the weather is appreciably different. If such an alternate doesn't exist, or if the extreme weather is so widespread that planned alternates are made useless, then the recall must be initiated just that much earlier.

Take a good look at weather recall procedures at your base. Are they designed to fit your particular situation? Will a recall get everyone down safe, even at the cost of a little training? Or is it a trap, just waiting for someone to spring it? ★



NOSE JOB

What started as a routine handling operation ended with a broken weapon nose. A crew of four was manually moving double-stacked weapons out of a storage igloo. With all four wheels of a bolster in the free-caster position, one of the crewmembers moved the front of the bolster to the left for positioning. The rear of the bolster shifted to the right causing the rear section of the bottom weapon to strike and break off the nose tip of a weapon on another bolster. Considering that the maneuvering area was only about three and one-half feet wide, the need for extra caution during the movements should have been obvious. The organization involved changed its local maintenance operating instructions (MOI) covering the particular operation. The crew is now required to lock the wheels in the trail position on the end of the bolster that they don't want to shift. A timely analysis of the MOI from a safety viewpoint might have prevented this incident. Have you and your nuclear safety officer thoroughly analyzed your MOIs from a safety viewpoint? If not, do so! You just might prevent another weapon "nose job."



NUCLEAR SAFETY AID STATION



DAMP NEGLIGEN

As you might expect, a "wet" missile is one has been exposed to fluids and contains det amounts of moisture in the interstage area cently, a field supervision team checked a Facility (LF) for run-off of water from meltin and reported to job control that water was under the launcher closure door. Although jo trol did dispatch a team to verify the water LF, no entry was made in the log book. Neith a maintenance team dispatched.

A month later a routine reentry vehicle change brought to light a wet missile which be returned to the depot. Negligence on the several persons is obvious. If you are a sup do your part by following through on all repor



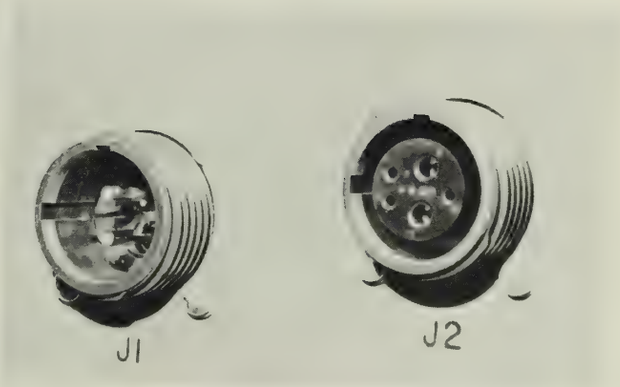
AID REPORTING

All Air Force units having nuclear weapons should closely monitor thunderstorm activity in their area and report all lightning strikes on or near missile or aircraft nuclear weapon systems. This includes strikes on or near storage facilities, maintenance facilities, launch facilities, landing ramps, etc. The yardstick for submitting AFR 127-4 nuclear mishap reports is to report a condition or event that degrades or could degrade nuclear safety (paragraph 1a). The lightning strike is an event which exposes a weapon system to an unusual environment which could degrade nuclear safety. The Air Force is vitally interested in lightning phenomena and their effects on missiles, aircraft, command and control, and monitoring/test equipment. We are also cooperating with the Atomic Energy Commission in a continuing program to assess the effect of lightning strikes on nuclear weapons. Aggressive field reporting of lightning strikes can assist immeasurably in maintaining adequate nuclear safety and improving the design of future nuclear weapons.

NUCLEAR SAFETY CERTIFICATION OF HANDLING EQUIPMENT

AFR 122-1 requires that only appropriate equipment and procedures that have received nuclear safety certification be used with nuclear weapon systems. Both the MJ-1 and MHU-83/E Lift Trucks have received this certification. However, as of 20 May 1971, the A/S32K-3 and MHU-83**A**/E, hydrostatic transmission versions of the Lift Trucks, had not received nuclear safety certification and, therefore, will **not** be used with nuclear weapon systems. We recently received Dull Sword on an MHU-83**A**/E which indicates that not everyone has received the word. Have you? How about nuclear safety certification of other equipment?

IT COULDN'T BE DONE

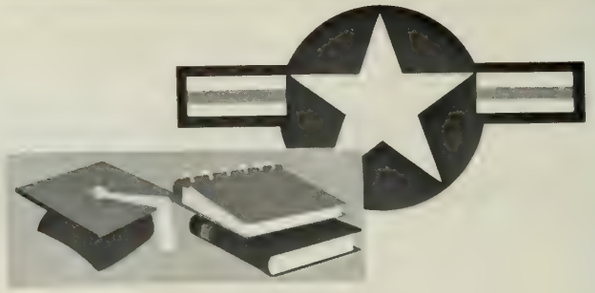


A recent incident involved two similar cables and their connecting plugs. Technical Order procedures called for removing the cable connected to J-2 (see photo). The technician removed the cable to J-1 by mistake, but didn't reconnect it before disconnecting J-2. This left both receptacles open. He then connected cable 2, which had a male connector, to J-1, a male receptacle.

Can't be done, you say? Remember Murphy's Law (if it can, it will) and take a close look at the photograph. Note how the key-slots match in J-1 and J-2. Note how the pins in J-1 jibe with the receptacles in J-2. As a matter of fact, investigators found it was easier to connect cable 2 to J-1 than to J-2!

The two male connectors fitted perfectly and, since both cables contained live power lines, a short circuit was the inevitable result. We were lucky on this one, and it was only an incident. But when stray currents start running around **any** missile system, there's no way to predict for certain what's going to happen.

There's just one answer: rigid adherence to tech data! ★



...the smart

Since we bought our first airplane it was obvious that if we could achieve a low accident rate, we could save some of those airplanes and people to use in much better ways. Sometimes in the past, our approach to safety problems has not been too professional. Various solutions attempted by our safety officers met with limited success. However, over the years safety has become a profession, staffed by trained personnel who have a good idea of what method works to prevent accidents and what approach falls on its face. This progress did not come about by accident. It was all part of a plan to insure that those individuals selected to spread the gospel were well prepared to effectively present a program that would preserve our combat potential.

However, safety officers, like ol' soldiers, fade away. So, to keep our ranks young and aware of the comparatively new techniques such as fault tree analysis and system safety engineering, many specialized courses are available to those assigned to the field as well as those who might be interested in the business of mishap prevention.

The following is a list of some of the schools that we in the Directorate of Aerospace Safety at Norton, to an extent, control. AFM 50-5 contains the entire list, but if you have an interest in broadening your safety knowledge, the Education Group is available to assist you. Most of the courses carry college credit and all require military retainability depending on length of the course. If you think you might be interested in attending one or more of these specialized courses, talk to your boss and personnel officer. For answers to any questions, contact the Safety Education Group here at Headquarters, USAF, and they will be more than glad to assist you in any way.

ADVANCED SAFETY PROGRAM MANAGEMENT—UNIVERSITY OF SOUTHERN CALIFORNIA, SIX WEEKS

A graduate level course designed to teach good safety management principles and techniques to fully qualified field grade officers or equivalent grade civilians serving at wing level or higher with the responsibility for safety field functions. The curriculum includes safety philosophy, accident data collection and analysis, statistics management, human relations and communication techniques.

CRASH SURVIVAL INVESTIGATORS COURSE—ARIZONA STATE UNIVERSITY, TWO WEEKS

Trains officers and civilians in the practical applications of aircraft crash survival concepts. Course covers aircraft accident investigation, injury prevention programs, new aircraft mock up evaluations, human tolerance to abrupt linear acceleration, post crash evidence and investigation techniques. Material presented is of specific interest to aviation safety specialists, medical personnel and design engineers.

FLIGHT SAFETY OFFICERS COURSE—USC, TEN WEEKS

Trains officers for flight safety officer duty. Course includes aeronautical engineering, aviation psychology, physiology, accident prevention, investigation. Thirteen college credits awarded upon successful completion.

route!

GROUND SAFETY OFFICER COURSE—NEW YORK UNIVERSITY, THREE WEEKS

Provides ground/explosives safety education for officers and equivalent grade civilians. Course includes basic safety problems, accident reporting, investigation and analysis, conference techniques, human engineering, safety councils and the use of statistics. Places primary emphasis on the supervisor's role in safety. Three college credits awarded upon successful completion.

MISSILE SAFETY OFFICERS COURSE—USC, TEN WEEKS

Provides university level safety education for officers or civilians assigned to manage USAF missile safety programs. The course objective is to provide students with an understanding of safety program management, safety principles, missile systems, and missile environmental factors. Includes theory of applied physics, propellant chemistry, fluid mechanics, propulsion systems, fundamentals of structures, basic electronics, industrial hygiene and psychology, and the mathematics necessary for an adequate understanding of these subjects.

SENIOR OFFICERS SAFETY COURSE—USC, FIVE DAYS

This safety orientation course provides colonels and general officers the opportunity to learn basic principles as well as techniques and management tools available to the commander in conducting an effective safety program. A review of the existing Flight Safety Officers Course curriculum and the opportunity to exchange personal experiences and ideas relative to aerospace safety programs will enhance the commander's utilization of his safety staff.

SYSTEM SAFETY ANALYSIS—UNIVERSITY OF WASHINGTON, TWO WEEKS

Trains engineers and technical staff members in the practical application of system safety analysis techniques. Course covers fault tree methods of analyzing systems for hazardous events. Terms and concepts of probability and statistics needed in the quantitative analysis of fault trees, human factors, and the use of computers in solving problems.

SYSTEM SAFETY OFFICERS COURSE—USC, THREE WEEKS

Trains personnel of USAF development, support and operational commands who are assigned to system safety engineering positions, system safety engineers in industry and other governmental or military services. Course contains fundamentals of system safety, appropriate system safety standards and specifications, i.e., MIL-S-38130A/MIL-STD-882, implementation of the system safety concept and identification of system safety problem areas. Emphasis is placed on the application of system safety principles in the pre-design and design phases of development and modification programs or projects.

NATIONAL AIRCRAFT ACCIDENT INVESTIGATION SCHOOL—DULLES INTERNATIONAL AIRPORT, WASHINGTON, DC, TWO WEEKS

Trains officers/civilians for aircraft accident investigation board duties. The course is conducted by NTSB and covers accident reporting procedures, witness interrogation techniques, human factors, aircraft systems and power plants, analysis of failed components, NTSB investigation rules and procedures.

Prerequisites, retainability requirements, and college credits given are listed in AFM 50-5. ★



IPIS APPROACH ARTICLES

We in the jet training squadron here at Andrews AFB have benefited regularly from your well researched and lucidly explained articles on instrument flying techniques. When we found in the current issue of Aerospace Safety your index of subjects covered, several of us began to choose those articles which we felt would be most useful to have in a permanent reference file. As more of our IPs joined the discussion, it soon became apparent that practically every article held special appeal to some of us, so we decided to ask you for a complete set.

About that time, the Stan/Eval Chief walked in, joined the discussion, and he decided that he wants a set for his pilots' use.

We then decided to go all the way and ask for an additional set for the recip squadron and one for the Wing.

So—could you spare us four complete sets? I promise that we will put them to work.

Robert L. Hill, Lt Col
Andrews AFB, Wash DC

We have forwarded your letter to IPIS/FTYI, Randolph AFB, Texas, 78148. I am sure they will fill your order for four sets of the IPIS Approach articles.

We have received several similar requests but we do not have the articles here in the Aerospace Safety magazine office and must forward the requests to IPIS. Anyone who wishes a set of the articles should write directly to IPIS at Randolph AFB.

POISON--WARNING

Customs agents have discovered costume jewelry made of Jequirity beans in the possession of persons returning from Africa and the Caribbean area. Necklaces and bracelets predominate. They are also used for eyes on carved coconut monkey heads.

The Jequirity bean, known by several other names, is small, hard, smooth, spherical and scarlet in color with a black spot. They are highly toxic and there is no antidote. Chewing or ingestion of the bean produces nausea, severe diarrhea with colic, weakness, accelerated pulse and tremors. It can be fatal. Treatment is evacuation of the stomach.

Be especially careful not to allow children to get possession of these beans. ★

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UNITED STATES AIR FORCE

WELL DONE AWARD

Presented for outstanding airmanship and professional performance during a hazardous situation and for a significant contribution to the United States Air Force Accident Prevention Program.

196th Fighter Interceptor Squadron, Calif ANG, Ontario International Airport, California



Captain George C. Neusse



Captain Roger L. Coakley

On 2 February 1971, Captain Neusse and Captain Coakley were returning from a night intercept training mission in their F-102. While still at 35,000 feet, the left center panel of the forward windscreen blew out. The violent wind blast and flying glass temporarily blinded Captain Coakley. Captain Neusse, in the right seat and at the controls when the failure occurred, immediately started a descent and turned toward land as he declared an emergency. Communication over the intercom was virtually impossible due to wind blast. UHF reception was slightly better. The instrument shroud had been severely damaged, and a large portion of it was broken loose and hanging by its wiring. The shroud damage resulted in complete failure of the left-side instrument lights, and caused the remaining lights to work only intermittently. Severe aircraft buffeting made reading the occasionally-lighted instruments nearly impossible. Captain Coakley recovered sufficiently to remove portions of the broken shroud and assist in the recovery by using his flashlight to help illuminate the instruments.

Captain Neusse continued on a course he believed would take them toward a suitable field. They were flying above an overcast and both compasses were unusable. Approach Control heard the flight on Guard Channel and assisted in join-up with another F-102 to lead a recovery. Approach Control had the only radio the crew could hear well enough to receive instructions. Throughout the letdown, all transmissions between wingman and leader had to be relayed through Approach Control. Slowing the aircraft caused buffeting to increase so that after join-up it was necessary to fly the GCA vectors at 300 KIAS. Captain Neusse held his position on the left wing of the leader as they entered the overcast at 8000 feet. Only after breaking out at 2300 feet on final approach did he slow the aircraft to 250 KIAS and lower the gear. By spiking the aircraft onto the runway at what would normally be an excessive speed he was able to maintain control until touchdown. In spite of the multiplicity of difficulties confronting them, Captain Neusse and Captain Coakley successfully landed their aircraft without further damage. WELL DONE! ★

Hi There!



Have you been getting your copy of AEROSPACE SAFETY magazine every month?

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UNITED STATES AIR FORCE

OCTOBER 197



Aerospace SAFETY

FOR AIRCREWS, MAINTENANCE & SUPPORT TECHNICIANS

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IF THE SHOE FITS

Supervisors in the Air Force take many forms—from the veteran on the flight line with all the stripes on his sleeve to some barely-able-to-vote youngster in the back seat of a UPT trainer. Supervision is usually thought of as a boss-subordinate relationship, but the word has a far broader connotation in the Air Force.

Supervision is specific terminology in accident analysis and identification of cause factors. Inspector General Data Manual 127-1 "Aircraft Accident and Incident Classification Elements and Factors" lists 20 conditions attributable to inadequately supervised flying training or operations. In addition, there are other conditions for aircraft and airbase maintenance.

While supervision is the primary factor in only about seven percent of our aircraft accidents, it figures much more frequently as a contributing cause. For example, maintenance was the primary cause when the engines on a C-130 were run up 650 feet in front of a C-47, causing the C-47 to jump its chocks and break the tiedown ropes. The Gooney was then blown into two parked aircraft. Supervision was the contributing cause in that the wing commander authorized engine runs within the parking area, and the squadron commander failed to provide adequate guidance for engine runups.

In another case, materiel factor was the primary cause, but supervision was a contributor because the System Project Office and the contractor failed to take adequate corrective action on an EUR that identified a hazardous condition.

Now—that seven percent where supervision is the primary cause. Here are some examples:

- The supervisor in charge of a fly-by demonstration watched the weather go sour but failed to cancel the fly-by.
- Flight of fighters was diverted from the intended base of landing to a nearby alternate. However, the weather at the alternate was poor also and the fighters had no ILS capability and precision GCA was not available.
- Flight leader led flight into a thunderstorm area.
- AC allowed pilot to make an unauthorized landing.
- All levels (of supervision) in that supervision, tech data and flight manual instructions were inadequate to insure safe . . . operations.

It is evident, from these few samples, that when the primary cause is supervision, usually one individual is identified. However, the last item above indicates that this is not always the case.

Though the identification of cause factors has broadened the scope of the term "supervision," the fact is that in these accidents somebody in some type of supervisory position failed. That is small comfort to the pilot identified as the primary cause when someone else could have prevented the accident. Two cases will serve to illustrate. In one case, a gear up landing, the RSO failed to check the gear down. In the other, an aircraft was recalled to a base below minimums. Cause factor in both cases: pilot. Contributing: supervision.

Poor supervision is identified repeatedly in incidents involving maintenance discrepancies. In some of these the list of failures gets quite long. A job is not done correctly; the inspector misses it and signs off the forms; the crew chief doesn't catch it on maintenance preflight; the crew overlooks it on walkaround. Most cases aren't this blatant, but this is not an isolated example.

The word supervisor implies authority and that is exactly what our supervisors must exercise if they are to do their job properly and effectively. While mistakes cannot be condoned, young maintenance troops can be expected to make them. That's why men with more experience, and more stripes, are looking over their shoulders.

The same is true for aircrews. Field grade officers, by both their example and supervision, are expected to make up for the lack of knowledge and experience of their juniors. This operates throughout the military hierarchy from the young captain instructing an undergraduate pilot right up to the men with stars on their shoulders.

In our society this is an age of permissiveness. Perhaps, in some respects, that is good, but not when it comes to condoning acts of irresponsibility that may cost another person his life. Our mission is too demanding, our aircraft too complex to permit the permissive approach to permeate aircraft maintenance and flight operations.

This article was based on an analysis of accidents over an 18-month period in which supervision appeared 20 percent of the time as either the primary or contributing cause. Is the message loud and clear? ★

SEE and be SEEN

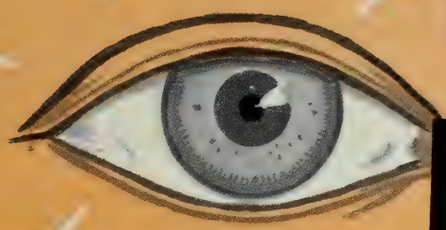




The T-33 was departing a midwestern base as #2 in a flight of two. He was about 3000 feet behind lead, rejoining, altitude 3500 feet MSL at 230 KIAS. The Tri-Pacer was climbing out of a nearby civilian airfield. He was one of five light aircraft in the immediate vicinity. Both aircraft were 3.5 to 4 miles from respective departure airfields. The T-33 was IFR under radar departure control. The Tri-Pacer was VFR. Weather was good.

Once again IFR clearance and radar control offered positive separation from *other IFR* traffic only. Radar advisories on other traffic are given to IFR traffic by controllers as work load permits, but the responsibility for clearance under VFR conditions rests with the pilot. ★

Our thanks to Major Russel G. Westcott, FSO, AFFTC, Edwards AFB, for this material.



THE EYE AND YOU

What do Pinocchio, Cyrano de Bergerac and Jimmy Durante all have in common? Big noses. What does that have to do with flying? Well, those noses could be a hazard if their owners happened to fly airplanes. Aside from the difficuty in getting an oxygen mask to fit, they would have had trouble with their vision. As long as they were looking straight ahead, everything would be okay. The time when they might find themselves a bit deficient would be when clearing the area for other airplanes.

Everyone has a built in eye defect, but because of a protruding proboscis, the defect becomes more significant. This defect is in the form of a blind spot located in the eye where the optic nerve exits the eyeball on the way to the brain. The blind spot is within the field of vision of each eye 45 degrees from center. However, we are unaware of these areas of blindness because of binocular vision. The left eye can see objects in the blind spot of the right eye and the right eye can see objects in the blind spot of the left eye. Thus we are not aware of any loss of vision. However, if something obscures one eye (such as the bridge of the nose) then this blind spot becomes a factor. At close range this is not significant. From a distance of eight or nine inches the circle of blindness is only about a half inch in diameter. Unfortunately, the farther away the object, the bigger the blind spot. At 200 feet the circle becomes six feet in diameter. At 300 feet you could fail to see a rather good-sized airplane.

Have you ever pulled out in your car at an intersection, only to hear the screeching of another vehicle braking? How could this be if you looked both ways? A door post could have easily blocked one eye, leaving the other eye operating with this blank spot.

How do you compensate for this limitation? Well, half the battle is won when we recognize that this phenomenon exists. The answer is to consciously turn our heads to bring our desired field of vision within 45 degrees of center. This, in most instances, will eliminate the problem of the blind spot. If this were the only limitation we have

+ •

Shut left eye—focus on cross, bring page slowly toward your eye and dot disappears.

with the problem of seeing and avoiding, it would be a fairly simple one. There are, however, several other factors that we should be well aware of if we are to make maximum use of our eyes.

Space myopia isn't limited to outer space. It occurs any time we are in a position where we don't have anything to focus on—in other words, a clear day where there is really nothing to see but blue sky. What happens is that, if we do not consciously focus on an object (a cloud, ground, etc.) and just stare at the open sky, our eyes relax and tend to seek a focus at a distance of 30-35 feet. If an object happens to be at this distance, it will be sharp and clear. Objects outside of this range will not be clear. The insidious thing about space myopia is that we may not be aware of it.

It's going to be tough to pick out another aircraft at five to six miles when we're all set to see something at 35 feet. The solution to this is to pick an object such as a cloud, focus on it and *then* look for your target. Fortunately, the procedure is rapid—it only takes about 1/5 of a second for our eyes to focus for distance. However, it does require this conscious act.

The object of all this exercise is, of course, to see another airplane in time to avoid a midair collision. Most of us looking out the windscreen are looking generally for some movement in the sky which will get our attention. This is not the best solution, however, since *an airplane that is going to collide with you has no apparent motion!* Conversely, *you will not cross wings with an airplane that has moved from the spot where you first saw it.* As a general rule of thumb, if you do see an aircraft which looks like a possible threat, try to keep him in sight. The ol' rule about air to air "turn into the attacker" applies pretty well in collision avoidance too.

There's only one way to for sure avoid a midair—don't fly. Since that method isn't too practical we will have to find a better solution. With the numbers of military and civilian flying machines airborne in these times, you are bound to be in proximity to another aircraft at

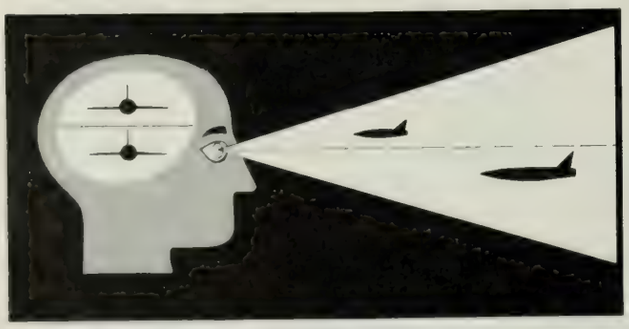


FIGURE A

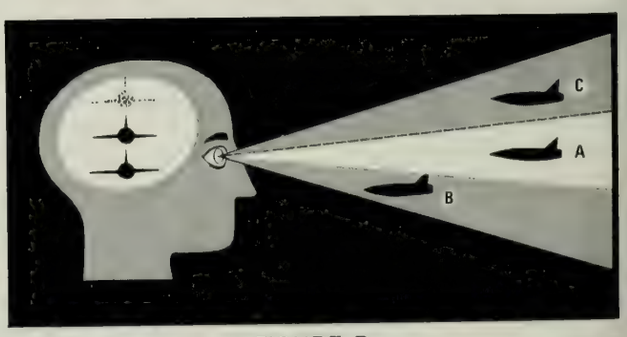


FIGURE B

This is extremely important because visual acuity is a function of the angle subtended by an object we are looking at. Figure A demonstrates that a smaller object would appear as large as a bigger but more distant object. Therefore, if altitude myopia occurs, a man might not perceive a C-5A at otherwise easily discernible distances. Figure B illustrates the decrease in visual acuity with the angular separation of an object from the cone of foveal (focused) vision. In Figure B, a pilot's eyes are focused on aircraft "A." Note that aircraft "B" is outside his cone of foveal vision and much closer. However, the pilot's mental perception of aircraft "B" is hazy although larger, while aircraft "C," at the same distance as aircraft "A," is perceived as being much smaller and more indistinct. This assumes that all aircraft are the same size; therefore, objects regularly separated by only a few degrees from an object that you are focusing on become much harder to see, regardless of their size or distance.

THE I.P.I.S. APPROACH

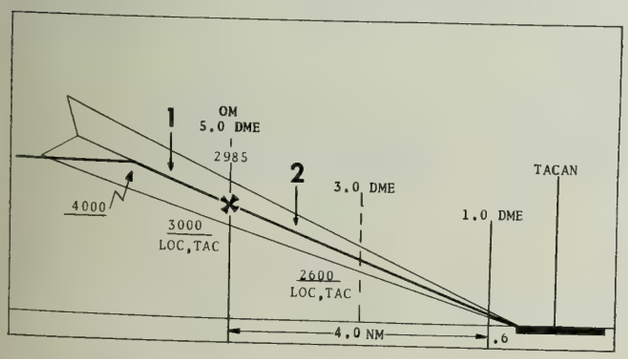
By the USAF Instrument Pilot Instructor School, (ATC) Randolph AFB, Texas

Q I'm flying an ILS approach. In the event I lose the glide slope indicator, what should I do?

A AFM 51-37 states, "If the glide slope warning flag is displayed, the approach should be flown no lower than the published localizer-only altitude or, if not published, no lower than circling minimum altitude for the aircraft category." The January 1971 "IPIS Approach" confirmed this, stating, "We know of no reason why you could not descend to 'LOC' or circling minimums and continue the approach in the event you lose the glide slope indicator."

The intent of both is to permit the pilot to convert from the precision ILS approach to a compatible non-precision approach. This will normally be the localizer approach. If localizer minimums are not published, the pilot may elect to use another approach (VOR, TACAN or ADF) published in conjunction with the ILS. It is a relatively simple problem to convert to an approach on the same page of the instrument approach procedures booklet. We do not recommend selection of an approach on a different page after the aircraft is established on final approach. This would be especially important in a single-piloted aircraft.

When the pilot discontinues the full ILS approach and continues with a non-precision approach, he must comply with all restrictions associated with that approach. Blindly descending to an MDA just because the glide slope is lost could cause problems.



Consider the above TACAN/ILS approach. You have just intercepted the glide slope at 4000 feet MSL. (Position 1.) If at that point you lose the glide slope and descend immediately to MDA, you would clearly violate the final approach fix altitude of 3000 feet and the 2600 stepdown fix altitude. If the same thing happened at position 2, you would violate only the stepdown fix altitude. The results, however, could be equally disastrous.

What to do then if for some reason you lose all glide slope information while flying an ILS approach? Good judgment must prevail. Convert to a localizer or other compatible approach if one is published in conjunction with the ILS. If you must fly a different approach, we recommend that you perform the missed approach, sort out your problems with approach control and fully familiarize yourself with whatever approach you intend to fly.

* * *

Q If I am being vectored to the localizer at an altitude above the glide slope intercept altitude, when may I descend to glide slope intercept altitude?

A You may descend to glide slope intercept altitude when the controller states, "Cleared for ILS Runway _____ approach." If terrain or traffic does not permit unrestricted descent to the lowest published altitude prior to final approach descent, the controller will either defer issuance of approach clearance or issue an altitude restriction specifying when or at what point an unrestricted descent can be made. If the approach chart depicts an altitude restriction between your position and the glide slope intercept point, comply with that restriction.

* * *

Q What should I do if I am cleared for the approach while still above the glide slope?

A This should not occur as the controller is required to vector you to the localizer at an altitude which will permit glide slope interception from *below*. If you are cleared for the approach while above the glide slope, begin a normal rate descent to glide slope intercept altitude. If you are unable to safely capture the glide slope, inform the controller and request further vectors. ★



Like the Phoenix they rise and fly again

CAPT LARRY M. SCHOENHALS, AFLC

More than 1100 crash- or battle-damaged aircraft have been returned to action during the past seven years by Rapid Area Maintenance (RAM) teams of Air Force Logistics Command. Working in all kinds of weather, sometimes in hostile areas and in primitive conditions, RAM teams have patched together some near "basket cases" for flight to repair depots and eventual return to service.

While equipment and methods have changed over the years, the recovery of crash- and battle-damaged aircraft is a job as old as military aviation itself. During World War I, each squadron had to recover its own crash- and battle-damaged aircraft. However, in those days of short-range aircraft, aerodromes in France were close to the front-line trenches, and planes downed on the Allied side were usually accessible by motor vehicle.

Airplanes were often forced down over the front lines with engine problems or damage caused by enemy fire. If the pilot was lucky enough to find a fairly flat spot between the shellholes and trenches in the wooded rolling countryside, his damaged aircraft might be repairable. When this happened, the mechanics removed the wings in the field and hauled the airplane back to the aerodrome on a trailer.

The long flying distances of World War II made recovery of downed aircraft by operational squadron mechanics impossible. This problem was solved by establishing Mobile Reclamation and Repair Squadrons, which were divided into mobile teams made up of men having various mechanical specialties. They followed the combat units across western Europe and into the heart of Germany, dispatching teams to pick up downed aircraft throughout the area. Overseas depots were set up in both World Wars to handle major overhaul jobs and to repair aircraft so heavily damaged that they could not be repaired in the field.

During the Korean War, crash and battle damage recovery was largely the responsibility of the base or wing to which the damaged aircraft was assigned. Overseas maintenance depot facilities to support the combat squadrons were located in Japan.

The present crash/battle damage recovery program began seven years ago with the formation of Rapid Area Maintenance (RAM) teams to assist operational combat commands on an immediate call basis. An advance group organized at McClellan AFB, California, was



An AFLC civilian mechanic points to battle damage in the outer wing of an F-4 Phantom in Southeast Asia. Repair of such damage is often beyond the capability of bases in Vietnam and RAM teams are called in to assist.



Aircraft that crash land near back country airstrips pose interesting recovery problems for AFLC's RAM teams. Whenever possible, the aircraft are temporarily repaired and flown to a major U. S. Air Base for Depot level maintenance.

equipped and deployed to Tan Son Nhut Air Base, Vietnam, just prior to the U. S. troop build up in Southeast Asia.

RAM became a working reality in April 1965, when a team of civilian specialists responded to a Pacific Air Force request for specialized maintenance on two crash-damaged F-105s. Both aircraft had been classified as economically repairable, but the extent of damage was beyond local base repair capability. One of the F-105s was repaired on-site at Danang Air Base, and the other was prepared for shipment to a contract maintenance facility in Taiwan.

By January 1971, RAM teams had been responsible for the on-site repair of 1000 aircraft. Another 148 had been readied for shipment to contractor repair facilities in-theater and to contractors or AFLC depots in the United States. Only 26 damaged birds were scrapped.

Circumstances facing RAM teams trying to prepare an aircraft for one-time flight often call for ingenuity and improvising. At the height of the Vietnam war, four members of a RAM team from the Sacramento Air Materiel Area went into the Vietnam back country to examine two crashed C-123 Providers.

The crashed aircraft were located near a crude forward runway in the jungle, and the RAM team had South Vietnamese troops standing by for protection as they set about preparing one of the birds for a flight to Saigon and a depot-level repair job. The aircraft needed internal structural repair and its nose landing gear replaced.

Lacking airplane jacks, the men obtained the assistance of about 40 local villagers who stood in the tail of one of the planes. This caused the nose to lift high enough so that oil drums and pallets could be slipped under it. The nose gear was taken from the other wreck and installed, and a nose wheel steering cable was fashioned from common fence wire. The damaged interior supports were replaced with angle iron.

Because the aircraft could make only right turns on the ground with its makeshift steering cable, it was pushed around by hand, lined up with the runway, and a successful takeoff was made.

Ninety percent of all damaged aircraft assigned to the RAM teams are repaired within 90 days. Extensive damage and occasional non-availability of major structural components are the primary reasons air-

craft repair sometimes exceeds the 90 days.

While in-theater contract facilities, such as those of Air Vietnam, Thai Airways, and Air America repair many badly damaged aircraft, RAM teams and AFLC depots have been responsible for the great majority of the aircraft returned to operational status.



When crash or battle damage is too severe to be repaired at overseas locations, RAM teams disassemble the aircraft piece by piece and package the parts for shipment to an AFLC depot in the CONUS.



Ed Adamic, Chief of the Field Services Branch at Sacramento Air Materiel Area, McClellan AFB, California, wrote the plan outlining the Rapid Area Maintenance (RAM) idea. He has spent five tours of temporary duty with RAM teams in Southeast Asia.

Fifteen basic maintenance skills are required for the RAM teams and more than 2000 civilian and 900 military personnel at AFLC's five Air Materiel Area depots are identified as having these necessary skills. Volunteers from this group alternate on temporary duty at overseas locations around the world for periods lasting from 90 to 179 days. The establishment of a ready-reserve pool of qualified maintenance personnel at each depot enables AFLC to respond within 18 hours to a request for assistance.

RAM teams are equipped with recovery kits containing pneumatic lifting bags, jacks, block and tackle gear, and the various ropes, cables, and slings necessary to lift and move damaged airframes. They also have peculiar item kits consisting of the equipment necessary to recover and disassemble specific types and models of aircraft.

The same perils faced by other ground personnel in the combat zone apply to RAM team members. Some have lost their lives, and others have been wounded in Viet Cong terrorist bombings and in enemy rocket and mortar attacks on military installations. But overall casualties have been light, considering the extent of RAM team involvement in the combat zone.

The skill levels of RAM team members are high. Most civilian team members have 20 or more years experience in their maintenance specialty, and military members seldom have less than eight to ten years experience. This vast cumulative experience, teamed with a rapid world-wide deployment capability, has saved the taxpayers more than two billion dollars in salvaged aircraft and spelled success for the crash/battle damage recovery program and the RAM concept. ★

REX RILEY'S
CROSS COUNTRY NOTES



REX RILEY
Transient Services Awar

O CLUBS vary widely from base to base, and unfortunately so do the dress requirements. It's not unusual for a crewmember to get stuck out unexpectedly and have only his shaving kit and no other clothes aside from his goat skin. Several of the bases we visited denied us entry into the club in anything less than a coat and tie, while others allowed casual dress and flight suits at any time.

One base solved the problem by providing a special section in the dining room where those unfortunate crewmembers with only casual clothes or flight suits could eat without offending anyone. However, the problem is there and it's up to each base to determine how to best take care of crewmembers engaged in performing the Air Force mission.

ATTITUDE is still one of my main gripes. No doubt there are a number of occasions when refueling is going to be delayed for some reason or another. How much nicer it is when the transient service troop says, "Gee whiz, sir, we're swamped and will get you just as soon as possible," rather than, "We'll get around to you eventually."

Maintenance control can play a big part in the smooth flow of transient traffic. We know of one base where the first priority was any transient with a maintenance problem. Sure there are exceptions, but the attitude of the guy who dispatches the specialists can often help expedite a transient's departure.

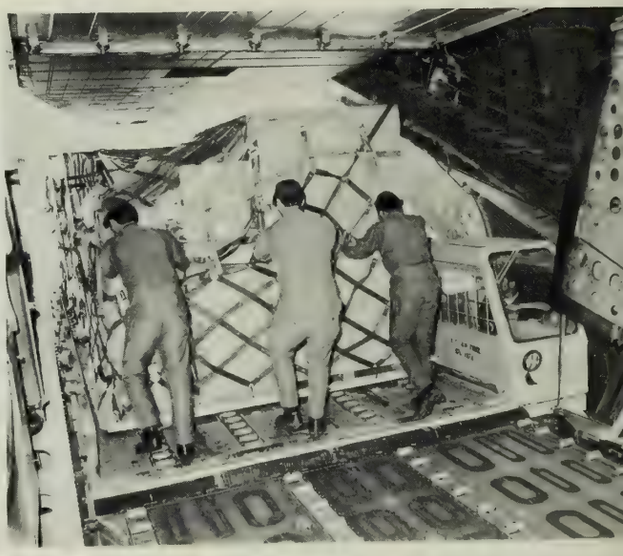
The **THUNDERSTORM SEASON** is about at an end but the problem never really goes away. Several base ops officers have expressed concern about refueling when there is a storm in the area. The reg states that if there is electrical storm activity within three miles refueling will cease. Some bases have extended this to five miles. The determination as to when refueling should be discontinued is a tricky one. The base ops officer must keep in constant contact with weather so that a valid and timely decision can be made. There may be a rain shower on radar but no thunderstorm within 50 miles. In any case, one eyeball on the weather can often be worth 100 sweeps on the scope. It's a tricky situation at best but the most important factor is a timely decision. Wish we had a good answer.

LORING AFB	Limestone, Me.
McCLELLAN AFB	Sacramento, Calif.
MAXWELL AFB	Montgomery, Ala.
HAMILTON AFB	Ignacio, Calif.
SCOTT AFB	Belleville, Ill.
RAMEY AFB	Puerto Rico
McCHORD AFB	Tacoma, Wash.
MYRTLE BEACH AFB	Myrtle Beach, S.C.
EGLIN AFB	Valparaiso, Fla.
FORBES AFB	Topeka, Kans.
MATHER AFB	Sacramento, Calif.
LAJES FIELD	Azores
SHEPPARD AFB	Wichita Falls, Tex.
MARCH AFB	Riverside, Calif.
GRISSOM AFB	Peru, Ind.
CANNON AFB	Clovis, N.M.
LUKE AFB	Phoenix, Ariz.
RANDOLPH AFB	San Antonio, Tex.
ROBINS AFB	Warner Robins, Ga.
TINKER AFB	Oklahoma City, Okla.
HILL AFB	Ogden, Utah
YOKOTA AB	Japan
SEYMOUR JOHNSON AFB	Goldsboro, N.C.
ENGLAND AFB	Alexandria, La.
MISAWA AB	Japan
KADENA AB	Okinawa
ELMENDORF AFB	Alaska
PETERSON FIELD	Colorado Springs, Colo.
RAMSTEIN AB	Germany
SHAW AFB	Sumter, S.C.
LITTLE ROCK AFB	Jacksonville, Ark.
TORREJON AB	Spain
TYNDALL AFB	Panama City, Fla.
OFFUTT AFB	Omaha, Nebr.
ITAZUKE AB	Japan
McCONNELL AFB	Wichita, Kans.
NORTON AFB	San Bernardino, Calif.
BARKSDALE AFB	Shreveport, La.
KIRTLAND AFB	Albuquerque, N.M.
BUCKLEY ANG BASE	Aurora, Colo.



Student operates K-loader as instructor watches.





Two views of cargo loading—outside the aircraft and inside.



Half of 80 hour course is spent in classroom.



Students learn to operate equipment during second half of course.

UALIFYING EQUIPMENT OPERATORS

FIGURE 1

- **Accident prevention.**
- **Basic design and mechanical knowledge of the equipment.**
- **Safety procedures, before, during and after operations.**
- **Location and use of fire bottles.**
- **Principles of preventive maintenance.**
- **Engine design and operation.**
- **Equipment operational limitations.**
- **Controls and their operation.**
- **Traffic safety.**
- **MHE operations around aircraft.**
- **General operation of MHE.**

Can you imagine what an airbase ramp would be like without material handling equipment (MHE) such as fork lifts, hi-lift trucks, K-loaders and the like?

Technology has provided us with these mechanical workhorses that smoothly transport the heaviest of objects to wherever we desire them. But we can't take our MHE for granted. Although it is fine equipment, it can and will be a source of accidents if not operated safely. The primary requirements for safe and efficient operation of MHE are (1) safe equipment, (2) adequate training, (3) cargo control, and (4) good supervision. All of these requirements are present in the program of the 63rd Aerial Port Squadron at Norton AFB, which has an effective 80-hour training course that produces MHE operators with a sound safety orientation, well on their way to becoming highly skilled MHE operators.

Half of the course (40 hours) is spent in the classroom where the student studies the subjects shown in figure 1. After completing the classroom phase, the student progresses to actual operation of the equipment, using mock loads in a training area set up to simulate the real flightline environment. Here he learns to operate the equipment under constant supervision of a highly qualified instructor. In order to move on to the real thing, the student must demonstrate the ability to

- Recognize potential hazards
- Perform pre-operational inspection
- Perform preventive maintenance
- Operate MHE under various conditions and loads
- Perform post-operational inspection and service.

Although the student is now assigned to the actual movement of cargo throughout the aerial port area, his OJT program will continue.

To monitor the training program and all operations and movement of cargo, the squadron commander has established a Safety Surveillance Program. Basically, this consists of one NCO being assigned to the cargo handling area for each eight-hour work period. The job of these NCOs is to monitor the cargo handling areas, being particularly watchful for safety violations. When the NCO observes an unsafe act he has a talk with the person involved and his supervisor, with recommendations for corrective action. At the end of each tour of duty he summarizes the events of the day in a memorandum to the commander. These reports are then used by the commander to determine corrective actions, for safety briefings and as a means by which to measure the effectiveness of the training program.

The payoff is qualified MHE operators who are safety oriented with the mechanical and operational skill to effectively perform during all phases of material handling. ★

1971
1970
1969
1968
1967
1966
1965
1964
1963
1962
1961

A review of Air Force aircraft accident experience, particularly for the past 10 years, indicates performance undreamed of prior to this period. The number of flying hours per year for the past decade has remained relatively constant, whereas the major aircraft accident rate has been reduced by approximately one-half, from 6.3 per 100,000 hours in 1961 to 3.0 in 1970.

To understand the significance of this we must look further back in history. The Department of the Air Force was established in 1947. That year the rate was 44. Since then the rate has gradually declined from year to year. By 1953-54 the rate had been halved and by 1959 it was below 10.

The numbers of accidents these figures represent are, perhaps, more meaningful. There were 1555 major accidents in 1947. The number rose to more than two thousand per year from 1951 through 1953, with a corresponding increase in flying hours, no doubt reflecting the Korean war years. In 1954 we got below the 2000 figure again, and in 1958 recorded 894. Since then the number of accidents has been reduced more slowly, but reduced it has been, reaching an all-time low of 200 in 1970.

Many of us took a look at those figures for last year and wondered what the future would bring. Would the numbers go back up? Had we reached the irreducible minimum—a term that has been bandied around for at least 10 years? Or did they represent solid accomplishment that forecast a continuing trend? The first six months of this year seemed to point to the latter alternative, with the number of accidents running about 25 per cent below last year.

We realize that drawing conclusions from major accidents and rates alone does not present the most accurate picture. For example, there were 5742 incidents last year, more than 2000 of which resulted in aircraft damage. Any accident prevention effort must take those into account. However, an attempt to analyze that number of incidents is far beyond the scope of this article. That is something for the statistics and analysis people to dig into in an attempt to ferret out the causes and cures, since the difference between many incidents and accidents is only a matter of degree.

How is it that, while flying almost exactly the same number of hours, we had only 200 major aircraft accidents last year as compared to 2184 twenty years earlier and 432 just ten years ago? Any explanation would no doubt be highly subjective, depending upon one's experience and degree of involvement. But let's take a hack at it (the reader is free to make his own assessment).

For one thing, we have more reliable aircraft—in the broad sense, including engines and other systems. Maintenance equipment and techniques are better than ever. Our facilities have steadily improved. For example, navigation and landing aids are much more reliable, sophisticated *and* widespread. We have better runways, arresting aids and firefighting equipment.

Weather forecasting and the means of disseminating and using the information have improved tremendously. Better life support equipment enables aircrews to perform more efficiently and, in dire emergencies, saves lives.

These are concrete things at which we can point and say "that helped."

More difficult to analyze are the somewhat abstract contributors to accident prevention, such as the application of knowledge gained from past accidents, the contributions of System Safety, and better investigation and reporting.

Aerospace medicine has made many contributions, as has the continuing education of aircrews, maintenance and support personnel. Bet-

the

HALLENGE

ter management of resources, both human and material, and a highly professional corps of trained, and by now experienced, safety specialists are certainly factors.

These and other factors have made our overall accident prevention effort today a far cry from what it was 5-10-20 years ago. The improvements may not seem obvious when viewed at short range, but the long range look leaves no doubt of the steady growth of expertise in aircraft operation and maintenance as well as in the application of safety management. However, lest we become complacent, it should be pointed out that many discrepancies and some gross inadequacies continue to be revealed during Unit Effectiveness Inspections, indicating that our overall management is less than perfect.

With the all-time low accident rate in 1970 and the even better performance so far this year, the question arises as to just how far we can reduce the number of accidents. Certainly we have reached a point where continued improvement is increasingly difficult. It is suggested that there is a danger present in our zeal to reach new accident lows and that we must recognize it.

We have been immensely successful, but as it becomes more difficult to continue the downward trend, the temptation to become more restrictive could be counterproductive. No doubt we could reduce the number of accidents even more. We could do this by eliminating the more hazardous elements of flight—air combat training, bombing and gunnery, formation flying, just to name a few. But in considering any such restrictions we must keep the Air Force mission uppermost in mind.

We can't afford a *safe* Air Force that can't fight!

Therefore, we must continue to explore and develop methods of preventing accidents without compromising our ability to perform our mission. This will take some doing, but the task is not so formidable as it may seem.

Our technology has demonstrated that it can produce aircraft that are highly reliable, equipped with redundant and fail safe systems, that should be relatively free from materiel-caused accidents. Therefore, it appears that our greatest opportunities lie in the human area.

The objective of every safety program we have adopted is accident *prevention.* However, one of our best prevention tools is the historical records. If we fail to heed the chapter written in the past, we ignore or negate a large portion of our efforts. The axiom that history repeats itself is so true. Year after year we write new chapters that tell us we learned little from earlier mistakes—pilots continue to bust minimums, they insist on buzzing or grandstanding, airplanes are accepted with equipment that doesn't function perfectly, but will "probably be okay." Eliminate these repeats and we can't fail to reduce our rate.

While there is nothing to indicate that we will ever return to the hundreds, even thousands of accidents-per-year-era, the coming years will test our ability to more effectively manage our resources. Because of Air Force experience with advanced systems and the application thereof, we are in a unique position to exploit both the technical and human engineering advances of the past few years.

We call this *management.* Our capability to perform any required mission, with the least number of losses due to accidents, will be the yardstick against which our ability to manage will be measured. ★

Ops topics

CATCH THE DRIFT

The two-ship flight of jet fighters was accomplishing a pre-briefed formation full-stop landing after a range gunnery mission. All went smoothly throughout the approach until just after touchdown. Prior to drag chute deployment, the wingman, who had been positioned on the upwind side before starting the approach, drifted left and allowed wingtip contact between the two aircraft. Neither aircraft was seriously damaged, but the potential was certainly there. The runway in use was 150 feet wide—plenty of room to be safe.

RIGHT ON!

"The aircraft made a very smooth landing, and the nose gear was lowered bently to the runway."
—from a recent aircraft incident report.

WHAT INSTRUMENTS?

The following incident is almost unbelievable. The aircraft was a C-130 and the task was a four-day trash-hauling mission in an overseas (non-combat) area. The two crews involved must have set some sort of record for low-priority, high-risk pressing.

Narrative from the first flight crew:

"Before takeoff all throttles were advanced to flight idle, at which time the number four engine instruments indicated completely abnormal engine performance. Torque varied from 5000 to 18,000 inch pounds; RPM from 80 to 104 percent; and fuel flow from 700 to 2500 pounds per hour. This occurred slowly over a ten second period from the low to the high readings. The torque and fuel flow were always high when RPM was low, and vice-versa. Additional throttle movement did not rectify the situation, nor did placing the TD switches to null or the prop controls to mechanical. Once started, the situation would correct itself in 30 seconds to a minute. *This abnormality occurred six times in four days, during which 13 takeoffs were accomplished. The last of the six incidents resulted in a flameout."*

After the flameout, the engine was checked over by maintenance personnel at an en route base. They were unable to duplicate the malfunction and the aircraft was released for flight; the next aircrew was thoroughly briefed on the malfunction.

The next day, prior to the second takeoff of the day, the engine again acted erratically and flamed out. After re-start the engine operated normally and the aircraft was flown to the home station. There maintenance found that the negative torque system plunger in the propeller valve housing was sticking in the actuated position.

If you can read the instruments and understand them, but choose to ignore the information presented, not just once but continually, that's just plain bull-headedness. The epitaph might read, ". . . with complete dis-

regard for his own personal safety, *and that of his passengers and crew. . . .*"

An addendum to the report states, "Other than instances described herein, engine operated perfectly. . . ." We wonder how many accidents that statement would fit.

THAR SHE BLOWS!

MAJ DAVID H. HOOK
CF, Directorate of Aerospace Safety

The T-33's canopy stuck in the full-open position, so the back-seater attempted to troubleshoot by checking the canopy circuit-breaker. He pushed his checklist aside from where it lay on top of the right console, and reset the canopy circuit-breaker to insure a positive connection.

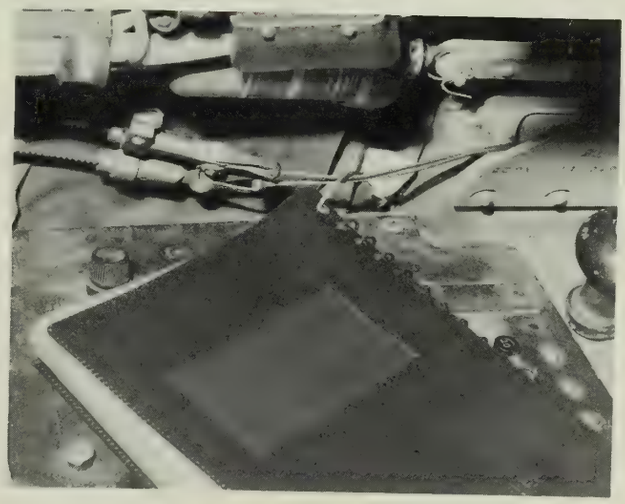
Whether or not that fixed the canopy motor was not reported, because when he retrieved his checklist (it came free with a light tug), the canopy catapult fired, ramming itself into the cockpit floor. The canopy stayed on the aircraft.

The accompanying photograph shows how the metal binder on the checklist snagged one or both cables from the alternate jettison handles. Snagged in this manner, a pull of only 15 pounds is required to deliver a 30-pound pull at the initiator. Thirty pounds and a fraction of an inch of travel were all the initiator needed to do its job.

Booby traps like this are not confined solely to our older aircraft. Aircrews and maintainers must always be alert to detect hazards that have previously gone unnoticed or unreported. FOD involves not only loose objects but also snagged clothing, watches, rings, and things.

FLIP CHANGES

Los Angeles and New York TCAs: Effective 16 September 1971, the Terminal Control Areas were expanded to include Los Angeles and New York. Graphics are included in Section II FLIP Planning North and South America, dated 16 September 1971. In addition, an outline of the TCAs is shown on the FLIP Enroute Low Altitude US L-3, L-24, L-25, L-28 and Los Angeles Area Chart.



CONT'D

UPWIND, DOWNWIND

The cargo-type prop aircraft was being flown on a pilot upgrade mission—day VFR. Several instrument approaches were made in VFR conditions, followed by a series of touch-and-go to runway 26.

On the fifth touch-and-go pattern the IP commented that the windsock indicated a slight tailwind, and the crew noticed a tumbleweed rolling slowly down the runway. Touchdown was normal, but slightly hot. The aircraft ballooned, and in the ensuing "recovery" entered a porpoise. Both nose tires were slipped from the wheels, and the severe vibration threw loose equipment around the cockpit and knocked off the pilot's glasses and headset. The IP applied reverse thrust and the pilot got on the nosewheel steering; eventually the aircraft was stopped, still on the runway. Three main tires had blown, and there was visible damage in the nose well area.

Weather in the area is significant. In five minutes the wind shifted from 290 at nine to 110 at 21; almost a twenty-knot tailwind factor on runway 26.

Significant also is the fact that on each downwind the tower advised the crew of the rapidly changing wind conditions. (In fact, the tower was in the process of changing the active runway when the incident occurred.)

The investigator said that the IP shouldn't have allowed the pilot to get into a porpoise, and we certainly can't disagree. However, he also said that the pilot used improper techniques while landing with a tailwind, and that flight examiners in the organization had been requested to put special emphasis on techniques pertaining to landing with tailwinds.

There are many instances when landing with a tailwind component is the sole course of action available, and there are certainly some valid techniques which make the downwind landing more tolerable. But in this case, the very best technique would have been to turn the airplane around and land the other way.

CROSS-HANDS TECHNIQUE

The helicopter crew—pilot and instructor pilot—were on a night training flight when they began having trouble with the interphone. The pilot could receive interphone transmissions from the IP only when the IP used the "call" position on his wafer switch.

Because of the interphone difficulty, the IP, holding the aircraft in a hover, elected to maintain cyclic control with his left hand and reach across the center console to adjust the collective friction (on the pilot's collective stick), rather than direct the pilot in the right seat to make the adjustment. During his attempt to adjust the collective friction, the IP let the aircraft enter an abnormally nose-high attitude at low altitude, and the helicopter crashed.

Crew coordination is a subtle thing, and its significance grows to massive proportions during critical phases of flight. This pilot's basic error was in not attaching sufficient importance to the partial failure of the intercom system.

Like snakes, the little things hide in the grass until you make yourself vulnerable.

TIPTOE THRU THE TREETOPS

The HH-53 was making a takeoff from a remote training site. Immediately after takeoff, at about 70 feet AGL, the pilot made a left turn to depart the area. Shortly thereafter the crew chief reported a whistling noise in the cabin, so the crew returned to home base and landed. There they found dents in four main rotor blade tip caps. Returning to the remote training site, they found that the aircraft had chopped approximately five feet out of the top of a pine tree.

This was an incident-damage considered insignficant. But suppose, just for a moment, that that pine tree had been a telephone pole, or had had a steel cable attached to it. Ground level operations have a fatal attraction for pilots, and only the most professional of attitudes is protection against the disaster that this sort of operation invites. There's no room in our business for any other attitude.

CLOSE QUARTERS

The jet trainer trailed the "follow me" truck to the parking ramp, following the yellow taxi line. The taxi line terminated about 50 feet from the edge of the ramp, and the pilot then diverted his attention to the airman who was directing the aircraft parking. He started a sharp right turn at low speed, watching the airman for guidance, and the left wingtip struck an oxygen cart parked along the edge of the ramp.

Primary cause: pilot factor, of course.

Contributing cause: lack of a wing-walker.

We've surely heard this story before; seems like everyone's using re-runs this summer. ★

IT'S... YOUR MANUAL

SQDN LDR DONALD MELVIN, RAAF
Directorate of Aerospace Safety

Frequent complaints have been heard from the field regarding the quality of the data contained in aircraft technical manuals, especially flight manuals. From time to time inaccuracies do occur, but in the majority of cases the responsibility for these rests with the users. For example, investigation of a recent fatal accident revealed that a serious discrepancy existed in the flight manual regarding the use of the carburetor heat control. This had been known to the operating unit for some time, but no action had been taken to clarify the Dash One information.

Two main avenues are used to amend flight manuals; AF Form 847, and Major Command Review Conferences. The functions of the program and the responsibilities of the various organizations affected are contained in AFR 60-9.

Commands are not using these avenues to their fullest advantage. Command participants at conferences should be the most qualified available and adequately briefed on the command position. If not, the conference tends to degenerate into a forum of personal opinions, and produces a product which is inevitably the target of criticism and adverse comment immediately after publication.

The AF Form 847 should be used for rectification of discrepancies and routine recommended changes. However, the standard of forms submitted in many cases leaves much to be desired. In some instances, inadequate or poorly researched and documented proposals have been coordinated through all command levels, only to be followed by a flood of additional proposals once published. Users have submitted changes without due regard to the impact on other sections of the manual or on other technical orders. Aircraft which are widely dispersed throughout the inventory, e.g., C-47, are the subject of recommendations which apply to only a specific task in a specific location, but its inclusion as proposed would affect all aircraft. Some recommendations, especially from accident investigation boards, tend to turn the Dash One into a Basic Flying Manual by proposing lengthy discussions on minor techniques, etc.

In some instances the Flight Manual Manager will detect and rectify these mistakes before the publication stage. These managers are highly qualified and motivated individuals who, in many cases, have extensive flying experience in the aircraft concerned. However, it cannot be disputed that, especially with the newer weapons systems, the operators are eminently more qualified to ensure that proposals are correct in every aspect.

Therefore, the quality of the manual is directly proportional to the diligence with which the proposed change is researched, the quality of command participation at conferences and the promptness of action taken to rectify noted anomalies. With proper management of the first two aspects, the last will require absolute minimum effort. ★



BRIEFS FOR
MAINTENANCE TECHS

egress system

There has been an increase in recent months in the number of egress initiators accidentally fired. The probable cause most often listed is personnel error. In one case the supervisor failed to insure that the checklist was used; in another, someone failed to insure that all safety pins were installed before beginning seat removal action.

One recent incident where two initiators were fired within the same system in a short period of time reads as follows: The egress team arrived at the T-38 to accomplish the phase inspection work cards. After the supervisor determined that the front seat was dearmed he gave instructions for the seat to be removed. When it was approximately two-thirds of the way up the tracks the seat belt initator fired.

The M-12 initiator safety pin was improperly installed. The pin had been installed around the linkage instead of through the initiator safety pin hole. Seat removal was completed and the seat was taken to the egress shop for replacement of the fired initiator. During in-shop maintenance, as the right-hand leg brace was raised, the M3A1 initiator in the left hand leg brace fired. The cause (of this second initiator firing by the same team) was failure to follow the step-by-step procedures in the TO.

More care, caution and careful adherence to the TO during egress maintenance will reduce the number of initiators fired inadvertently.

brake fire

It's no big thing, but the action taken as the result of the near-accident described here shows that maintenance types **can** get action to correct a bad situation.

Just after touchdown the pilot commenced light braking action. The left brake began to fade rapidly. Directional control was maintained with full left rudder and right brake while speed was reduced to 35-40 knots. At this time tower advised the pilot that the left brake was on fire. Both engines were shut down and the crew evacuated the aircraft immediately after it stopped rolling. Quick response by the fire department limited fire damage to the wheel and gear door assembly.

The cause of this near disaster was maintenance: the brake had not been properly installed and the pressure plate was installed backwards.

TO 1B-57B-2-2, page 5-68, depicts a caution note in regard to correct brake installation; however, this caution note did not appear with the step-by-step instructions on page 5-69 and 5-70.

An AFTO Form 22 was submitted by this unit, approved by the AMA, and the warning note has been added to the appropriate pages.

short screws

During climbout an A-37 began to buffet as it passed through 185 knots. Buffet continued as airspeed reached 200 knots. The aircraft was slowed to 170 knots and the buffet ceased. Another aircraft joined up for a visual inspection and confirmed a loose inspection panel on the left lower stabilizer.

Once the bird was back on the ground, maintenance found all but four of the screws missing from the panel. In fact, one screw fell

from the aircraft after it taxied into the parking spot.

The screw that fell to the ramp was three-eights inches long; those remaining in the panel were 15 thirty-seconds inches long. TO 1A-37A-4 calls for a ten-thirty-two flat head screw 19 thirty-seconds inches long to secure this panel. It is probable that all the screws had been too short, and that those missing had vibrated loose and fallen out in flight. Review of the aircraft records did not reveal any recent work in this area. A new aircraft just delivered was checked and eight of the screws in the same panel were 15 thirty-seconds inches long and four were 17 thirty-seconds inches long. None complied with the TO requirements.

Correct hardware is essential. When in doubt, recheck the Dash 4; it won't let you down.

the bare facts

Just after takeoff for a day combat sortie the pilot felt a bump as he started a right turn. He looked over his shoulder and saw a large splash in the water. An immediate check of all weapons switches confirmed that all were in the correct position. After join-up, wing confirmed that the right outboard MER was missing.

The pilot could not determine what had caused the inadvertent jettison. He proceeded to the jettison area, released the remainder of his load and returned to base.

It didn't take the maintenance team long to determine the problem. They found a wire bundle in the conventional weapons relay panel that had not been properly secured as required by the TO. The wire bundle had chafed against the wall of the panel until bare wires were exposed.

battery explosion

A crew chief had been instructed to run up and leak check his T-37. After an FOD check and walk-around inspection, he climbed aboard the aircraft, started the engine (with external power) and taxied to the run-up pad.

Following a leak check by his assistant, the crew chief advanced power to 100 percent. After approximately 30 seconds an explosion occurred in the battery compartment area. The engines were shut down. There was no evidence of fire following the explosion.

The explosion was caused by the accumplation of trapped gasses in the battery compartment because the vent lines were disconnected. Inspection of the lines showed them to be free of any restrictions. During review of the aircraft forms, it was found that the battery had been changed just prior to the incident.

Battery gasses are highly explosive as was proven here. Wet cell batteries evolve hydrogen gas. In the gaseous form, hydrogen and air mixtures are very flammable. Hydrogen air mixtures containing as little as four percent or as much as 75 percent hydrogen by volume are readily ignited. When hydrogen air mixtures are confined, the mixture is shock sensitive and can detonate. Therefore, the hazard in a confined condition is extreme.

Gaseous hydrogen and oxygen mixtures are flammable over the range of four to 94 percent hydrogen by volume.

In view of the above data, proper ventilation is an absolute necessity.

the high price of FOD



The photograph above is a grim reminder that FOD can cause an aircraft to crash.

During liftoff after a normal approach to a touch and go, the aircraft pitched up excessively, climbed sharply, then nosed over into a dive and crashed.

The cause was traced to the screw shown. It worked its way into the horizontal stabilizer flight control system, caused excessive stick pressures and binding, and finally jammed the horizontal stabilizer in the nose down position.

FOD prevention must be a 100 percent effort. Any less can be catastrophic.

MORE



hot FOD

Immediately after takeoff, Nr 3 overheat warning light illuminated, then immediately changed to a fire indication. The engine was shut down, fire agent was discharged and the light went out. After an uneventful return to base the engine was checked and a burned rag was found between the left engine door and the starter valve. Maintenance had been performed in this area prior to departure.

This incident would not have occurred had the maintenance personnel completed their job, which includes removing all equipment, tools, rags, etc., prior to releasing the aircraft for flight.

man and prop

Much has been written and said concerning the many hazards of daily flightline operations. Safety on the ramp requires the efforts of each and every man.

When we talk of ramp safety, the first things that come to mind are jet intake and exhaust, since these areas are a continuous hazard. But we also have another age-old hazard: propellers. Prop type aircraft have been around a long time and a lot has been said about their dangers. In spite of this we still have accidents. One occurred during ground maintenance. A C-119 was being ops checked after maintenance, when a sergeant who had been leak checking the engine walked into the rotating propeller. Fatigue contributed to the sergeant's lack of mental alertness. He had had only four hours sleep in the past 24 hours because he was employed in an off-duty job.

Another accident occurred when a crew chief walked into a rotating prop after parking an OV-10. Contributing causes in this case were poor ramp lighting and local procedures in that aircraft were chocked before props had stopped spinning.

It is the supervisor's responsibility to educate and re-educate his personnel in the potentially hazardous areas of the flightline operation. Mental alertness, proper lighting and sound operational procedures keyed to safety oriented personnel will go a long way toward eliminating this type of accident.

F-4 lost

The F-4 crew heard a muffled explosion followed by a right engine fire light. The wingman confirmed fire in the aux air door area and along the bottom of the aircraft.

The engine was shut down, mission aborted, and the crew headed home; however, they were forced to eject five minutes after the initial explosion due to the intensification of the fire.

Investigation revealed that the right engine had been started pneumatically, although a cartridge was installed in the breech. Stray voltage ignited the cartridge during flight and the starter disintegrated, rupturing the fuel feed elbow, which resulted in a fire. Maintenance bought this one for allowing the aircraft to be started pneumatically and flown with a live starter cartridge in the breech. A contributing factor was failure of the tech data to warn against pneumatic starts with unfired cartridges installed.

torque topics

We continue to receive incident and/or accident reports with the cause listed as improper torque. The proper torquing of any item is one of the most critical phases of maintenance.

One incident which occurred on a T-38 turned up 163 hours after the work had been accomplished. The report reads, "Number two oil pressure fluctuation from 35 to 45 psi followed by pressure drop to 10 psi. The engine was shut down in flight."

The culprit was stripped threads on the oil return line connected to the main gear box housing assembly. The O-ring seal was also found damaged. The assembly had been overtorqued during prior maintenance.

In another incident the right engine overheat warning light illuminated during initial climbout on a functional check flight following periodic inspection. The throttle was retarded to idle but

the light remained on. The engine was shut down and a single engine return to base was uneventful.

The reason for the light was a loose clamp (PN 4265-2815H) on the refrigeration unit, which allowed hot air to escape and contact the fire warning control box assembly.

1T-37B-2-2 gives the proper torque for this clamp, but it is evident that proper torque was not applied.

The responsibility for insuring proper use of torque tools rests with the supervisor. Don't go along with the mechanic who believes that "turn 'em down tight and another half turn" will do the job. Insist that all items be torqued in accordance with tech order specifications.

for want of a clamp

During operational check of the cartridge starter on number eight engine, the cartridge appeared to fire normally; however, no RPM was evident. A visual inspection revealed cartridge exhaust smoke coming from all seams and openings of the engine cowling.

Toward the end of cartridge burnout a minor explosion was heard. Visual inspection revealed damage to the starter transfer tube and upper and lower panel assemblies. Further inspection failed to locate the starter transfer tube attachment clamp. It was determined that the clamp had been left off during TCTO 1B-52-1994.

This error cost the maintenance team approximately 83 additional manhours for repair, degraded the wing's operational ready rate and caused a lot of red faces.

After-the-fact changes have been made in this unit. In the future all starters will be operationally checked, using the universal tester, prior to installation on the aircraft.

T-37 throttle torque

A T-37 was involved in an incident which, fortunately, didn't result in any damage.

As he started into a Cuban 8, the IP in the T-37 noticed 98 percent RPM on the right engine with full throttle selected. He retarded the throttle and advanced it full forward again but obtained only 92 percent. The mission was aborted.

Cause factor: improper torque of the throttle linkage jam nut. Although saftied, it had worked loose, allowing the ball joint to back off misrigging the linkage. Proper torque goes hand in hand with safetying. Safety wire can't substitute for proper torquing.

rush job

During an alert launch of two F-100s, the wingman noted a flight control failure light during the end of runway check. Two crew chiefs and the alert supervisor arrived and started removing the hydraulic access panel from the lead aircraft. The lead pilot got their attention and sent them to the second aircraft. They immediately serviced the flight control system and sent the birds on their way.

When the flight returned to base the hydraulic access panel on Lead and the flight control system service panel on Wing's aircraft were missing.

The maintenance crew in their haste to get the birds off on an alert mission failed to properly secure the panels.

Don't let the pressure of an alert launch, or any job, rush you into causing an unsafe condition. Do the job correctly even though it takes a little longer.

crossed wires

The functional check flight for number two prop governor change on a C-131 went well until number two engine was shut down in accordance with the checklist. The prop feathered okay but failed to unfeather. An emergency was declared; an immediate return to base was uneventful.

Maintenance discovered that during the governor installation the electrical cannon plugs for the pressure cut-out switch and reverse and unfeathering solenoid had been crossed. The red cross in the 781 Form had been cleared by an authorized inspector, who failed to note the crossed cannon plugs. Wonder how they could have missed that during the operational check? ★

how to handle



GENERAL

Teflon hose assemblies should always be handled with extra care to prevent excessive bending, twisting, and kinking. Dragging hoses on concrete surfaces, using them as climbing handles and bending them to fit into cramped storage areas must be avoided. Kinking of Teflon hose occurs more easily in larger sizes and in very short assemblies. Extra care should be exercised in handling and installing all Teflon hose assemblies. NEVER STEP OR STAND ON TEFLON HOSE.

PROPER STORAGE

Prior to installation, Teflon hose assemblies should be capped with appropriate dust caps and stored in an area free from dust or other contamination. Do not use cramped or otherwise confined storage areas. If long lengths of Teflon hose are coiled for storage, a liberal coil diameter must be provided to insure against kinking. Never coil Teflon hose so that the minimum bend radius is, or can be, exceeded.

INSPECTION

1. Internal: Inspect internally for evidence of tube restriction due to collapse, wire braid puncture, or other damage.

2. External: Inspect Teflon hose assemblies for excessive wire damage consisting of two or more broken wires in a single plait, six or more broken wires per assembly, or per lineal foot whenever assemblies exceed 12 inches in length. Assemblies with excessive damage should be replaced.

CHAFE PROTECTION

Chafe guards of Teflon or Vinyl sleeve material should be used any time there is a possibility of chafing. Chafing may be caused by routing of the hose assembly or by tight locations. Assemblies should be routed to avoid sharp corners, if possible.

PREFORMED HOSE ASSEMBLIES

Teflon hose assemblies tend to preform to the installed position on hot fluid lines. Always permit the assembly to take its own lay when being removed or stored. When shorter bend radii are required, the assembly may be preformed at the factory. Factory preforms are secured into shape prior to shipping. Extra care should always be exercised when handling preformed hose assemblies, whether they are new lines or lines removed from an installation. Never attempt to straighten a preformed hose.

A convenient method for the handling of preformed hoses is shown in the accompanying detail drawing. Tie wires securing the hose in its preformed shape are installed at the point of preform. This prevents straightening or kinking of the line during subsequent handling. The tie wires should remain installed during proof pressure tests. Remove them just prior to installation.

Do not use the Teflon hose line for a handle when accessories or components are removed from engines or aircraft.

TIPS FOR PROPER INSTALLATION

1. Attach the hose to the most inaccessible end of its routing first. Finger tighten only, so that the hose is free to turn during installation.

TEFLON hose

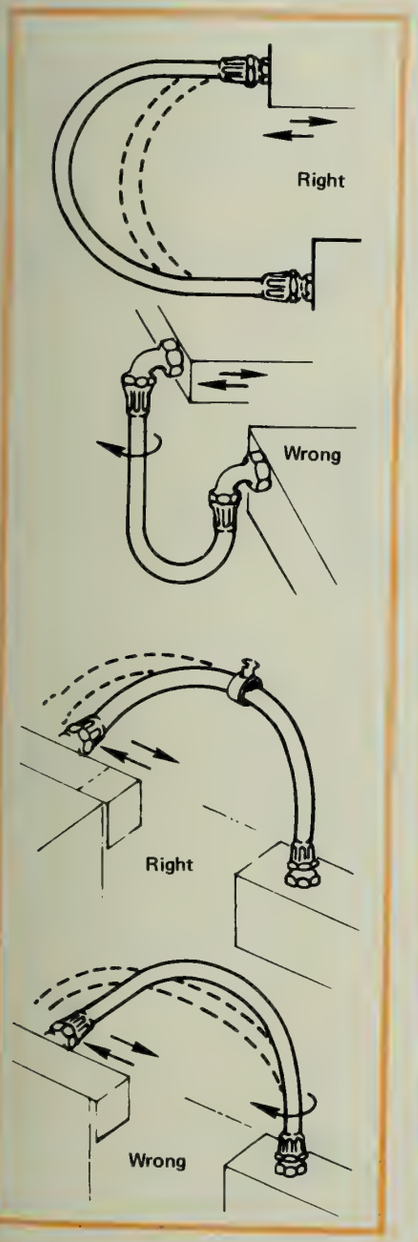
H. M. COOKE
Staff Engineer
Stratoflex, Inc.

2. Attach the other end of the hose in the same manner.

3. Properly orient the hose along its routing and install the required line support clamps.

In securing the line support clamps, care should be exercised in distributing hose slack between the hose connections and the clamps. Do not bend or force the hose to a sharp angle at any location. Be sure that gradual curves are used for all routing. Installation of clamps must never restrict travel or cause the hose line to be subjected to tension, torsion, compression, or shear stress during flexing cycles. Installation of undersize hose support clamps must be avoided.

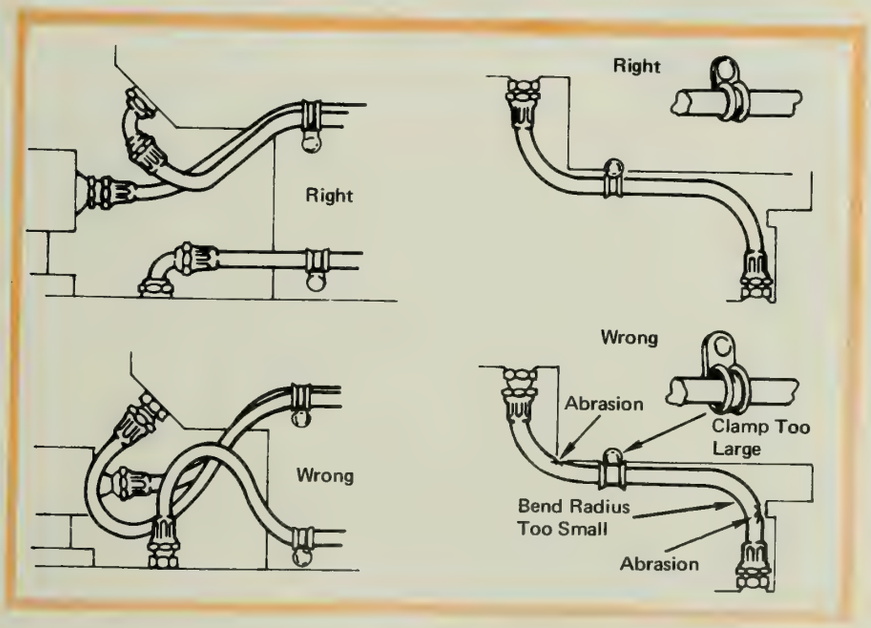
4. Torque the fitting connection and clamps to the recommended values.



INSTALLATION

When installing Teflon hose, assemblies should be positioned so the flexible portion of the hose extends at least one and one-half times the hose diameter before starting the bend. Two wrenches should be used to tighten end connections to prevent twisting of the hose or overtorquing of fittings. One wrench should be used to hold the nipple hex while the other is used to tighten the swivel nut. On hose assemblies that do not provide a hex for holding, extra care must be taken to prevent twisting of hose. ★

(Vought Maintenance Digest)





NUCLEAR SAFETY AID STATION



ALARM SECURITY, AND YOU

Alarm systems are designed to detect intruders trying to penetrate secure areas. When they don't perform as designed, then security, and in this case nuclear safety, is degraded. As a result of wear and improper maintenance, wind was able to move the doors on a storage building sufficiently to cause the alarm to ring. It became normal procedure to reset the alarm by wiggling the door. The discrepancy came to light when a two-man policy violation occurred in conjunction with one of these "false" alarms.

If you are depending on an automatic alarm to maintain security, don't lose that confidence by allowing poor maintenance. Report such discrepancies and have them repaired immediately.



FLASHING LIGHT

A routine and common Dull Sword is the one that reports a light on the Minuteman control consoles which is momentary or is extinguished by use of the inhibit switch. The most common reported are "enable," "launch in process," and "missile away" lights, although there are others. The majority are explained as caused by transient signals due to lightning in the area, missile test, or spurious voltage spikes. Faulty electronic drawers are also a cause. New equipment is now available to help trace down these transients, but they must first be reported to build up a data file. Your assistance is solicited in reporting the transients promptly with as much detail as is available to you.



LOAD CREW?!?

After all the years we have had load crew training, load crew certification, checklist discipline, etc., it would seem that never would a three-man crew attempt to function as a four-man load crew. Well, it happened in 1971 and here is a list of discrepancies that occurred during an unloading operation:

a. Supervisor permitted three men to function as a "load crew."

b. "Load crew" failed to install initiator cartridge safety pin.

c. "Load crew" failed to insure proper lanyard removal.

d. "Load crew" failed to check off steps as they were performed.

e. TAIL CONE BLEW OFF AND THE WEAPON PARACHUTE DEPLOYED.

Let this be a warning. If it happened once—it can happen again, and the next guys may not be lucky enough to avoid injury.



Toots

is interested in your problems. She spends her time researching questions about Tech Orders and directives. Write her c/o Editor (IGDSEA), Dep IG for Insp & Safety, Norton AFB CA 92409

Dear Toots

What do we do or how can we run an aircraft that is on a red cross? It is a problem area on an H-43 helicopter when we change a collective limiter and it requires a leak check after installation. To properly leak check the item, it must be physically checked with the seat and panels out, since it is located under the copilot's seat. My question is, can we run an aircraft on a red cross and be covered?

When a pilot's or copilot's seat is removed, it is a mandatory red cross. I am following TO 00-20-5, page 1-1, para H.

We could install the seat, sign the red cross off, run it, put it back on a red cross and check it after the run, but if we do it that way, how can we assume the leak (if there was one) didn't come from another area, since there are other lines in that area?

Big question—can we legally run an aircraft on red cross?

MSgt Pat Bowers
Det 12, 43 ARRSq
Randolph AFB Texas

Dear Pat

Good to hear from you again.

TO 00-20-1 states that a red cross indicates that the aircraft is considered unsafe or unfit for flight and that the aircraft will not be flown until the unsatisfactory condition has been remedied. It also states that the use of the red cross symbol has been established to insure inspection of the work performed and/or accomplishment of a review of all related maintenance records for completeness and accuracy by an inspector or supervisor who is authorized to clear red cross symbols.

In answer to your question, yes, you can run an engine while the aircraft is on a red cross, provided that all systems affected during engine run are operative—hydraulic, electrical, etc.—and in your case, provided that the Chief of Maintenance does not have a policy where he requires both seats to be installed with two men at the controls.

Toots

Dear Toots

TO 4T-1-3, para 6-4D, states that tires which pass the 12 hour leak test will be marked as acceptable for installation. If storage or shipment of the tire is necessary prior to installation, the tire pressure will be reduced to 20 psi. Tire assemblies awaiting installation are not considered storage.

My question—if we have to send a tire assembly cross-country for a bird which is down at a transient base for a tire change, must we deflate the tire assembly prior to placing it aboard one of our fighter type aircraft for delivery?

Puzzled Sergeant

Dear P. S.

I talked with the OPR for TO 4T-1-3. They say yes, the tire assembly must be deflated for all air shipment.

Toots

EXPLOSIVES SAFETY

THE EGRESS SYSTEM GUN IS LOADED

Mishaps involving inadvertent firing of explosive initiators during periodic maintenance and inspections of aircraft seat and canopy ejection systems are increasing.

Reports indicate that these firings are attributed primarily to personnel error. Maximum emphasis should be placed on the importance of proper training and care in all phases of handling, installing, removing and using cartridge/propellant actuated devices associated with emergency escape systems. All commanders and supervisors must place increased emphasis on existing safety programs to preclude inadvertent firings of explosive initiators.

Pertinent factors to be stressed are:

Hazards: Supervisors must assure that all personnel are thoroughly familiar with hazards involved when working with or near explosive cartridge/propellant actuated devices, and that pertinent technical data and safety directives are complied with at all times.

Standing Operating Procedures: SOPs will be made available covering handling, installing, removing and inspecting propellant actuated devices.

Seat and Canopy Removal and Replacement: Accomplish in strict compliance with applicable aircraft maintenance handbooks.

Safety Standards: Insure that strict safety standards are enforced to prevent accidental ejection of aircraft seat and/or canopy by maintenance personnel.

Ground Safety Pins: Insure that prescribed ground safety pins are properly inserted and flagged in each initiator during the time the aircraft is undergoing periodic or other type inspection, or maintenance.

Orientation and Familiarization Program: Establish a continuing orientation and familiarization program to insure that all personnel, directly or indirectly associated with the safety requirements of these systems are fully aware of the hazards involved.

Explosives devices should be afforded the same precautions and respect as a loaded gun. . . .

They can kill, maim, and destroy! ★

UNWANTED CARGO

The C-130 was outbound from Vietnam after an in-country troop transport mission. After several hours enroute, one of the passengers, resting on a pile of seatbelt straps, grew tired of a lump poking into his backside and began rearranging the pile of straps. The "lump" turned out to be a very sinister-looking projectile!

The passenger notified the loadmaster, who notified the aircraft commander, who came aft and made a *very* careful inspection of the object, and then diverted immediately into the nearest military facility with an EOD team available.

The EOD team was waiting when the aircraft landed. They identified the projectile as a 40mm grenade and removed it from the aircraft.

The in-country missions had involved troops with full combat packs, and the grenade was probably left behind unintentionally. The off-loading of the troops had been made with engines running, and the usual close inspection after troop off-loading had been degraded. When the aircraft was re-configured for cargo, the projectile was unnoticed and inadvertently covered by the extra straps.

This incident need not have been associated with Vietnam. Our "workhorse" cargo planes carry troops all over the world—including the U.S. Anytime somebody boards the airplane with something that shouldn't be left behind, a careful inspection of the cargo compartment is in order. ★

Aren't You Glad You Use . . .



SOAP

GE Jet Service News

Are you using SOAP regularly? You should, you know. In fact, it's required. And we're not talking about your personal hygiene, but the Spectrometric Oil Analysis Program.

This program has been in operation for several years now, and has proven to be a worthwhile maintenance tool. It's the ideal kind. If used and interpreted correctly, it helps you to detect trouble before it becomes serious trouble.

With SOAP, the condition of enclosed mechanical systems is monitored by the Air Force through spectrographic and spectrophotometric analysis of lubricating fluid samples taken routinely from each system. The wear particles produced from the contacting surfaces of moving parts is evenly distributed within the lubricating fluid. Because the particles are sub-microscopic, they remain in suspension in the fluid. The analytical results obtained from one sample to the next provide information about the type and amount of wear taking place. Abnormally wearing components can therefore be detected long before they fail.

Your engine TOs and TO 43B2-1-9 and 42B2-1-10 give specific information on frequency of sampling and interpretation of results.

After a sample is obtained, it's sent to a SOAP lab. A couple of different devices are available for determining the content of wear-metals in the fluids. They're based on the determination of wavelengths of light produced when a sample is burned in controlled conditions.

Metals when burned produce light energy. Each basic element radiates light of a wavelength characteristic of that element and each is different. The amount of light is proportional to the amount of an element present. The SOAP labs burn your samples and are able to tell how much, in parts per million, of various elements are present.

They are particularly interested in the content of iron, copper, magnesium, chromium, aluminum, silver, tin, and titanium, because these are the common metals in gear boxes and bearing areas. A one-shot analysis tells little. But trends developing over a period of time or a jump in a metallic content indicates that action should be taken to find out why and where.

There are several things that you can do to help. Keep meticulous records. It does no good to know that a sample contains a high concentration of iron and copper if you don't know from what engine the sample came.

Keep the sampling equipment clean, and don't introduce material from outside the lube system while you're doing the sampling. A little sand (silicon) isn't going to help in an analysis.

Keep the sampling devices out of the system. More than one engine has been wiped out because the lube passages were plugged with a sampling bottle or bottle cap.

We've barely scratched the surface and the TOs will fill you in, but the message is loud and clear—Use SOAP! ★



MAIL CALL

COMMENTS

While preparing a letter to you on one article, another article of equal interest appeared in the August issue. Here goes on both articles:

a. In the October 1970 issue an article in Tech Topics, entitled "Down Time," caught my eye. It concerned an A-37 pilot confronted with the problem of his seat bottoming out during his first range pass. The disturbing part was the bit about "the pilot *installed the pins* and readjusted the seat" *and continued* on in the gunnery pattern. Unnecessary occurrences such as this, loaded with potentially hazardous possibilities, give any Safety Officer heartburn. The resulting loss of a canopy in this occurrence only reinforces a procedure that has been proven many times over. If something mechanical goes wrong with the bird, take it home and get it fixed.

b. In the August 1971 issue an article appeared on page 13 that I am intimately familiar with. The second article, an F-106 accident, took place during my tenure as Flying Safety Officer at that installation. I left the base, under honorable conditions, about a month later, and at the time the report indicated that the big culprit was materiel failure and not maintenance. The pin bag was improperly positioned; however, nothing was found during the resulting tests to identify the pin bag as the cause factor. Lab analysis of the eyebolt assembly indicated *no* bending associated with the failure. A pure tension failure was indicated.

I enjoy reading your magazine very much. It is a fine publication that you can be duly proud of.

Maj Edward Larson
Chief, Specialized Safety and Flight Operations Div
DCASR, San Francisco

Thanks for writing. We agree wholeheartedly on the A-37 comment. As we have stated many times, if you have a problem with a bird, get it back on the ground and let Maintenance take care of it.

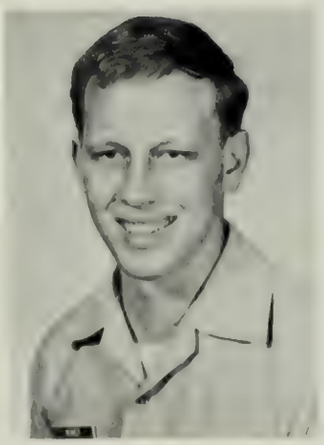
As for the F-106 article, you are right—up to a point. When you departed that duty station, all indications were that the primary cause was Materiel failure; however, later investigation pointed to Maintenance as the primary factor.

* * *

CONTROLLER EXTRAORDINAIRE!

SSgt Richard L. Wines, air traffic controller, now assigned to the 2054th Communications Squadron, Sheppard AFB, Texas, is a million dollar controller—in fact, a 43-million dollar controller.

As mobile radar approach control crew chief and air traffic controller in the 1998th Comm Sq at Korat RTAFB, Sergeant Wines "saved" 19 crewmembers in 15 seriously imperiled combat aircraft valued at over $43-million. Quite a contribution to accident prevention, wouldn't you say?



AERO CLUBS HONORED

49 Air Force Aero Clubs were recently honored by the Federal Aviation Administration for flying accident-free in 1970.

Bergstrom AFB, Texas, received its fifth consecutive award. Arnold AFS, Tennessee, and Vance AFB, Oklahoma, were honored for the fourth consecutive year. Receiving awards for three consecutive accident-free years were Air Force Academy, Colorado; Grissom AFB, Indiana; March AFB, California; and Whiteman AFB, Missouri.

Aerospace Safety magazine adds its congratulations. Well Done!

U.S. GOVERNMENT PRINTING OFFICE 1971 789-121/2

UNITED STATES AIR FORCE

WELL DONE AWARD

Presented for outstanding airmanship and professional performance during a hazardous situation and for a significant contribution to the United States Air Force Accident Prevention Program.



Major
BERNARD W. McCAFFREY

9th Tactical Reconnaissance Squadron, Bergstrom AFB, Texas

During a low-level mission, Major McCaffrey spotted two large birds directly in front of his RF-4C. Although he at once alerted his navigator and took evasive action, a bird penetrated the canopy and destroyed the integrity of his ejection system. The drogue chute was dislodged from the seat and forceably deployed into the airstream. The violence of the deployment and wind blast jerked Major McCaffrey back into his seat with sufficient force to crack his helmet, strip off its visor and housing, and leave him temporarily dazed. His oxygen mask shifted over his eyes and shattered plexiglass caused superficial lacerations and bleeding. This further disoriented him. When he became reoriented, he decided against ejection. After regaining control of the aircraft, which was now at 4000 feet in an 80-degree bank, he rolled wings level and then evaluated the damage. His canopy was missing except for the lower right side. He attempted to contact his navigator but was unsuccessful. Moving the rear view mirrors, Major McCaffrey discovered the rear cockpit ejection tube was extended to the eject position.

After appraising his situation, he decided to return to Bergstrom AFB. Using emergency checklist procedures, he contacted Austin Approach Control which gave him vectors to home plate. Major McCaffrey then requested that another RF-4C inspect his damaged aircraft. Because of his injuries and risk of greater damage, he decided not to engage the barrier and made a successful straight-in landing. Postflight inspection revealed that Major McCaffrey's parachute was missing with his shroud lines blown rearward into the rear cockpit and along the fuselage. Portions of his chute were found around the bellows probe on the vertical stabilator. Major McCaffrey was not aware of the parachute malfunction. If he had elected to egress, he would have been a certain fatality. After the bird impact, the disoriented navigator was unable to communicate with Major McCaffrey. He ejected and sustained major leg injuries.

Major McCaffrey quickly evaluated the risks, recovered from a hazardous flight situation and saved a tactical aircraft. WELL DONE! ★



DON'T SIMPLY TOLERATE
THAT WHICH IS NOT RIGHT,
CHANGE IT!

29.1305
FLYS

UNITED STATES AIR FORCE • NOVEMBER 1971

Aerospace SAFETY



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Astronaut James B. Irwin salutes U.S. flag at Apollo 15 Hadley-Appenine landing site. Hadley Delta in background. Mountain rises 13,124 feet above plain. Photo was taken by Apollo 14 Commander, David Scott.

UNITED STATES AIR FORCE NOVEMBER 197

Aerospace SAFETY

FOR AIRCREWS, MAINTENANCE & SUPPORT TECHNICIANS

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NOVEMBER 1971 AFRP 127-2 VOLUME 27 NUMBER 11

WHAT YOU TOLD US

Every so often it is a good idea to pause and take stock of things, just to make sure you are going in the right direction. *Aerospace Safety* magazine did that last summer by having several questions included in a USAF Sample Survey. We wanted to know whether you are getting the magazine, how well you like it and whether you find it useful in your work. The instructions called for only persons in flying operations, maintenance and flying support activities to answer our questions. Here's what you told us.

Eighty-four percent of the officers have little trouble getting the magazine, but only 57 percent of the airmen are able to get one. This indicates that we will have to improve distribution and correlates with other items that point to the same thing.

In order to understand what the figures tell us, it is necessary to know who answered the questions. Here's who: Sixty-one percent of the officers were in flying operations, 10 percent in maintenance, and 28 percent in support activities. The airman breakout was *flight* 9 percent, *maintenance* 40 percent, and *support* 51 percent.

The third question asked whether the respondents found *maintenance* articles useful in their job. We were gratified to learn that 54 percent of the officers answered in the affirmative. However, only 38 percent of the airmen so answered. This bothered us until we checked back and found that only 49 percent of the airmen completing the survey were in maintenance or operations jobs, 51 percent being in flying support occupations.

Then we asked about flying articles. Two-thirds of the group of officers engaged in flying operations (60 percent of the total number surveyed) said that these articles were of value to them. Twenty-nine percent of the airmen found flying articles useful, which surprised us because only nine percent work in flying operations.

Next we wanted to know if you find the articles in *Aerospace Safety* interesting. What we had in mind with this question was, aside from their usefulness to individuals, are the articles well written, and do they cover the right subjects? Seventy-nine percent of the officers and 55 percent of the airmen said the articles are interesting.

Finally we wanted to know if articles in the magazine ever help anyone during an emergency. We really didn't expect much on this question, but in this business you seldom get a chance to see direct results from your efforts. So we were very happy to see a startling 21 percent of the officers and 17 percent of the airmen had been helped in an emergency by something they had read in *Aerospace Safety* magazine.

This survey indicated that you are finding the magazine useful, interesting and of direct application in your work in maintenance, flying operations, and in flying support activities. It also indicated a couple of soft spots that we have already started to work on. Remember, you don't have to wait for a survey. Write or call direct anytime. If it is a question, we'll do our best to get the answer. If it's a gripe, tell us and we'll try to get whatever it is changed, fixed or resolved. ★

We don't know if shamrocks will grow on the moon, but Colonel James Irwin, lunar module pilot and one of Apollo 15's all-Air Force crew, put one there. Colonel Irwin kindly granted *Aerospace Safety* an interview to give our readers some insight into how it felt to be one of the select few who has been privileged to take that

Walk on the moon



ASM: Jim, from the time you were selected as an astronaut, how long was it until liftoff?

COL IRWIN: Just over five years, but it went so fast. It seemed more like two or three. Time never did drag; everything was so interesting.

ASM: Were you and the rest of the astronauts personally involved in the safety design aspects of the command and lunar modules?

COL IRWIN: I guess I have been involved in the design of the lunar module since shortly after I was assigned. When a new engineering change comes up that effects system operation we always get involved up here in the astronaut office. We get a chance to consider it from both the operational and flight safety standpoints. We had some new gear on board, in our particular lunar module, having to do with failures that might occur to the ascent engine—that it might fail to ignite. We had some new electrical harnesses that we could plug into either bus in the descent stage giving us a little more insurance that we would get ignition from the ascent engine.

ASM: How much do you have to say about cockpit design—such things as where the switches are put?

COL IRWIN: Well, at this stage in the game everything is pretty well set in concrete. All our spacecraft have already been built. However, originally the astronauts who were here had a great deal to say about the layout of both the command module and the lunar module.



The all-Air Force Apollo 15 team.

ASM: Is there a problem interchanging crews, if for some reason one could not go?

COL IRWIN: I can't say there is no problem. It depends on when it occurs, when the change has to be made. I think this was put to the test when on Apollo 13 Jack Swiegert took Ken Mattingly's place. It depends on which crewman it is. Everybody works so differently that you get used to working with the same person.

ASM: Most of the training is done here at Manned Spacecraft Center, isn't it?

COL IRWIN: Yes, it is until you come up for the next flight; in other words, the 16 crew will now move into the simulators at the Cape, the 17 crew will take over the simulators here; we, as backup crew for 17, will train here until Apollo 16 goes, then we will move our training equipment down to the Cape.

ASM: What type of confidence levels do you have that you will successfully complete your mission?

COL IRWIN: We do have a very high level of confidence because of redundancy and high quality control. I would say I was 99.9 percent sure the mission would be successful.

ASM: What goes through your mind when you hear that phrase, "We have ignition"?

COL IRWIN: I guess we always expect it—ignition. It is gratifying and heart-warming that you've got those engines burning down there, but I guess the call that was more meaningful to me was "tower clear," because that portion between ignition and "tower clear" could be very critical. If you had a failure, not so much of an engine, but if you had a hard over, it might swing you into the tower and you are pretty well strapped there. Once we had "tower clear" I figured we were really on our way.

ASM: Are you so familiar with the systems in the module that you can minimize the checklist and do each one of you have a particular system that you specialize in?

COL IRWIN: We have a checklist for every operation of the spacecraft—the launch checklist, which takes us through launch, through earth orbit, through translunar injection and then after that we get into the flight plan. The flight plan has all the steps required; if it



No traffic problem here. Jim Irwin and the Lunar Rover.

doesn't, it refers to a systems checklist for detailed operation of any systems in the command module. Then when we get into the lunar module, we have an activation checklist—we have a timeline book which essentially duplicates the flight plan in the command module. We have a surface checklist and then to supplement that, we have cue cards for the EVA preps and posts, so everything is covered by a checklist. If there is a malfunction of any equipment, we have malfunction procedures and the entry in those malfunction procedures is in the symptom—hopefully, it is a caution warning light that illuminates. Then we would refer to the malfunction checklist which we carefully and methodically complete. We also have schematics for all the systems—like a TO—so if the malfunction procedure doesn't do the job for us we refer to the more detailed system schematics to also help us in understanding the malfunction procedure. We have several pounds of paperwork on board. I think it was something like 40 pounds of paperwork in the form of flight plans and checklists.

ASM: As you travel through space, does your onboard computer keep your location pinpointed at all times —say in terms of nautical miles from earth and so forth?

COL IRWIN: It doesn't read out that particular parameter, but I am sure that within the computer that knowledge is available. We frequently take star sightings with the optical system and compare them with the information that is in the computer for position. In addition, we get small torquing angles because of the drift of the platform. They were always very, very small corrections. There is just a wealth of technology improvements that have been made, because of the Apollo program, that I am sure will effect basic design of aircraft in the future.

ASM: How much difference is there between flying a space vehicle and flying a conventional airplane as far as attitude or control maneuvers or technique?

COL IRWIN: As far as attitude control, it handles very much like an aircraft except that you are making step inputs to change your attitude. As for the control system there is a greater flexibility—greater variety of control modes that are available to you.

ASM: How many backup modes do you have?

COL IRWIN: In the lunar module, for instance, we have the primary guidance system and we have the abort guidance system, so we have the two guidance systems available to us. We can automatically control the attitude in the spacecraft. In the manual modes, we have manual modes in both of those systems, controlling certain jets. Then we have another set of jets that we can select manually. Then finally we can go to the hardover on the controller and fire a set of jets, so we have all sorts of redundancy.

ASM: Did you carry the tape of the Air Force song up there secretly or did Mission Control know you had it?

COL IRWIN: I'm sure they knew we had it. They probably didn't know when we were going to use it.

ASM: I think the pictures were really more beautiful this time than they ever were before. Seems as if the cameras had been improved. The depth perception was much better. Do you have a feeling of invasion of privacy with so many people on earth watching you all the time?

COL IRWIN: You mean that little TV camera that followed us around? Actually we never gave much thought that they were watching us. In some instances I guess it gave us some degree of comfort to know they were watching over us. It has really paid off after the flight to play back those tapes and review what we did at each geological station so we could put everything in the proper order.

ASM: Do you think there is any fallout from your program into our undergraduate pilot training program? In other words, could the Training Command benefit from the ways in which you approach your training?

COL IRWIN: I think we have learned a great deal from the pilot training program, since all our new people on board, the scientists, went through the pilot training program. I think that since most of the people in our program have either been pilots or are pilots, most of our training is patterned after your program.

ASM: How about the family, how did they feel about it?

COL IRWIN: Of course, they are all happy that it is over with now. But they had no apprehension. They were very well adjusted, I thought, and prepared for just about anything.

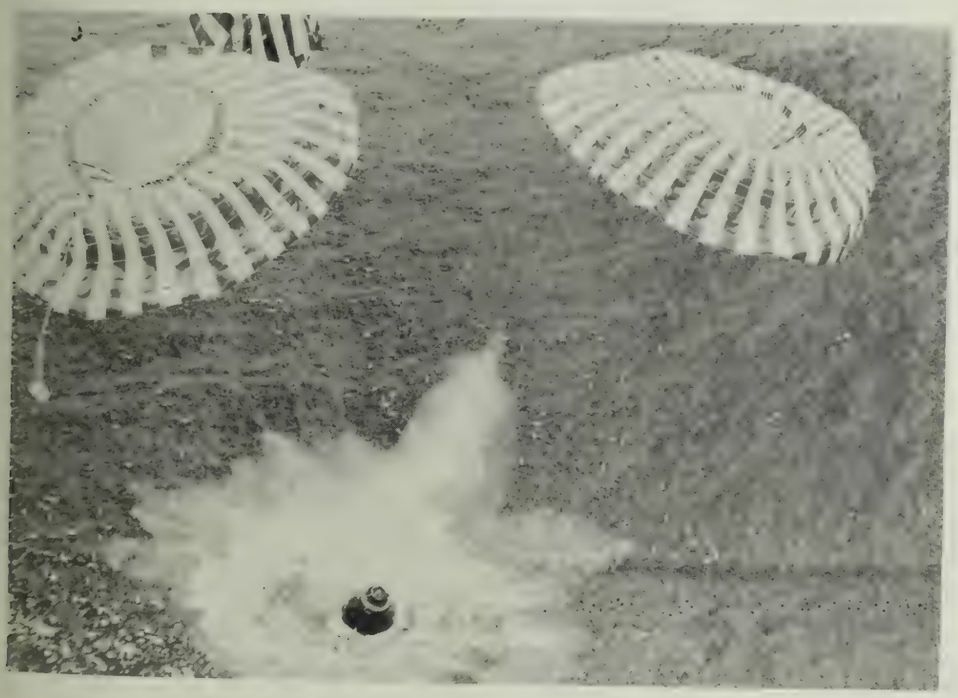
ASM: What are your plans now?

COL IRWIN: Our crew has been assigned as backup for 17, so after we finish the speech tour, the next two months, we'll be back here to get ready for the flight in December of '72.

ASM: Are you ready to go back again?

COL IRWIN: Yes! ★

ED. NOTE: Our thanks to our friends at the 63d MAW, Norton AFB, and the 147th Ftr Gp (ANG), Ellington AFB, for their cooperation in obtaining this interview.



Splashdown!

GUARANTEED ABSOLUTELY FOOLPROOF

Our language is rich in descriptive terms. A couple are "foolproof" and "failsafe." They sound good, but they are absolutes and we've long since become wary of anything that positive.

There's another word—Murphy—which has come to mean that if there is a wrong way of doing something, someone will. Here's a Murphy to disprove the wisdom of accepting the absolute terms cited in paragraph one.

First, to set the stage. After years of futilely attempting to prevent the servicing of aircraft with the wrong fuel, the Air Force devised a system of safeguards last December that gave promise of being effective. Regulations were rewritten, SOPs developed and hardware obtained. Everyone rejoiced. No more JP in recip tanks.

Enter Murphy to prove that if there's a way . . .

During refueling of a twin engine recip, the refueling crew noticed the fuel was frothing. Color check confirmed that the fluid was not 115/145 avgas. How come? The trucks had been fitted with locks, and keys were attached to dispatch folders, along with the other steps required to insure the correct fuel. (Fuel Servicing Controls, *Aerospace Safety*, May 1971.)

The explanation was simple—and chilling—because it showed one way of circumventing the system. The truck was old and scheduled for the boneyard. However, it had been filled with diesel fuel to be delivered to a communications facility. Then the truck was parked on the front line of the 115/145 POL parking area. This set the stage.

Step II. The driver got the wrong truck. Since it was scheduled for salvage, the lock on the truck pump valve had been removed. Step III, with no lock there was no need for a key. Why this didn't alert the driver wasn't stated in the report.

Fortunately, in this case, the wrong fuel was discovered before any harm could be done. Nevertheless, this experience should alert us to the fact that those words "foolproof" and "failsafe" should not be taken for granted. ★

almost

THE I.P.I.S. APPROACH

By the USAF Instrument Pilot Instructor School, (ATC) Randolph AFB, Texas

FLYING

Q Can I file in the high altitude route structure to a low altitude initial approach fix?

A Yes. There is nothing that restricts a pilot from doing this. High altitude instrument approach procedures are associated with flight in the high altitude route structure. Interestingly, the IAF altitude for some high altitude approaches is quite low (4000 feet for the TACAN RWY 3, Mathis Field, San Angelo, Texas).

* * *

Q If I have filed in the jet route structure to a low altitude IAF, what should I do in the event of radio failure?

A The rules governing two-way radio failure, as described in the IFR Supplement, still are applicable. We do not recommend filing a route of flight which may be impossible to fly in the event of communications loss. One example of this would be filing to an outer marker at FL 450. Obviously, a certain amount of discretion must be exercised by the pilot. You are required by FLIP, Section II, to "clearly indicate the proposed flight path." In the absence of instructions to the contrary, the proposed route will become the assigned route with communications loss. Good sense then would require that you file only what you would be able to fly in the adverse circumstance of two-way communications failure.

* * *

TDY TO TEXAS

The USAF IPIS is often asked by individual pilots throughout the Air Force how they can attend IPIS. The USAF IPIS has no direct control over who is selected to attend the course of instruction. The training "slots" are allocated to the various commands by Headquarters USAF. Current production of instructors is 140 per year. It is obvious that many units may have to wait a year or more to receive a training slot.

If your unit desires to send someone to USAF IPIS for instructor training, we recommend you submit an application for formal training through your local CBPO in accordance with AFM 50-5. The USAF IPIS course is listed as *USAF Instrument Pilot Instructor Course, Number F-V5G-A*. Using the application for formal training will help to match the training requirement and individual with the training slot at command level.

It is the goal of the USAF IPIS to have one graduate in every squadron in the Air Force. If no one in your unit has been to USAF IPIS, we suggest that you initiate action to send someone. ★

ELSIE



The Air Force is experimenting with an emergency escape system for transport/cargo aircraft that employs a linear shaped explosive charge. Called ELSIE (Emergency Life Saving Instant Exit System), it will cut emergency exits in an aircraft fuselage after a crash landing, allowing passengers and the crew to escape before fire destroys the aircraft.

ELSIE resulted from studies of the causes of death in survivable accidents. The studies showed that, in commercial aviation, approximately half of the persons involved in survivable crashes perish and half of the deaths are attributed to post-crash fire. The Air Force, likewise, has experienced fatalities from post-crash fire, due to the inability of crew and passengers to open jammed exits and escape. The causes of death among persons who seem to have been capable of unassisted escape were usually found to have been from asphyxiation due to smoke and fumes or burns. They simply didn't have time to get out before being overcome.

At first blush it would seem that more and bigger exits would be the answer. The desirability of this fades, however, when structural strength and weight penalties are considered. Linear shaped charges have been used for several years in a number of applications; for example, for stage separation on missiles and to separate the F-111 escape capsule from the airframe. They have proven to be highly reliable and safe.

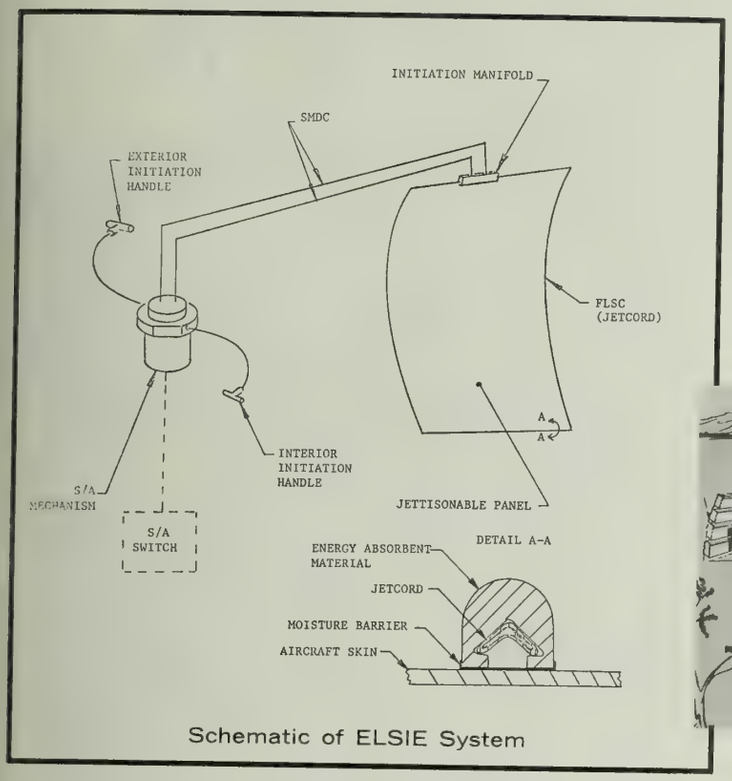
Since this seemed to offer an effective means of providing emer gency exits, the Deputy for Engi neering and the Life Support Systen Program Office, Aeronautical Sys tems Division at Wright-Patterso AFB, is developing the ELSIE sys tem under a contract with Explosiv Technology of Fairfield, California

Advantages of the ELSIE are:

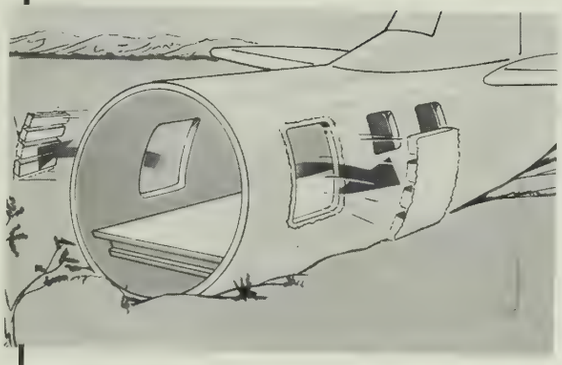
- Opens emergency exits i less than one one-thousandths c a second.
- Is jam-proof even after se vere deformation of the fuselage
- Door jettisons outward.
- Is instantly operable after crash, by passenger or crew, y cannot be operated inadvertentl

Currently two applications of th system are in operation. One is

Adapted from material supplied by Capt Burt Chesterfield, Life Support Project Engineer, ASD



Schematic of ELSIE System



an AC-130 where no opening in the aircraft structure exists prior to actuation of the system. The other is a door within a door which is being installed in an ASD Flight Test C-131.

In the AC-130, the system is an integral structural part of the airframe. When the charge is fired, an opening of a pre-determined size is instantaneously cut in the fuselage. The system installed in the C-131 is mounted in the emergency exits and is intended for use only when the door cannot be opened by other means.

To insure safety, the following requirements were established:

(1) The actuating mechanism must be manual. That is, not be dependent on any external energy source, such as the vehicle electrical system.

(2) Arming capability is provided only in the pilot's crew station.

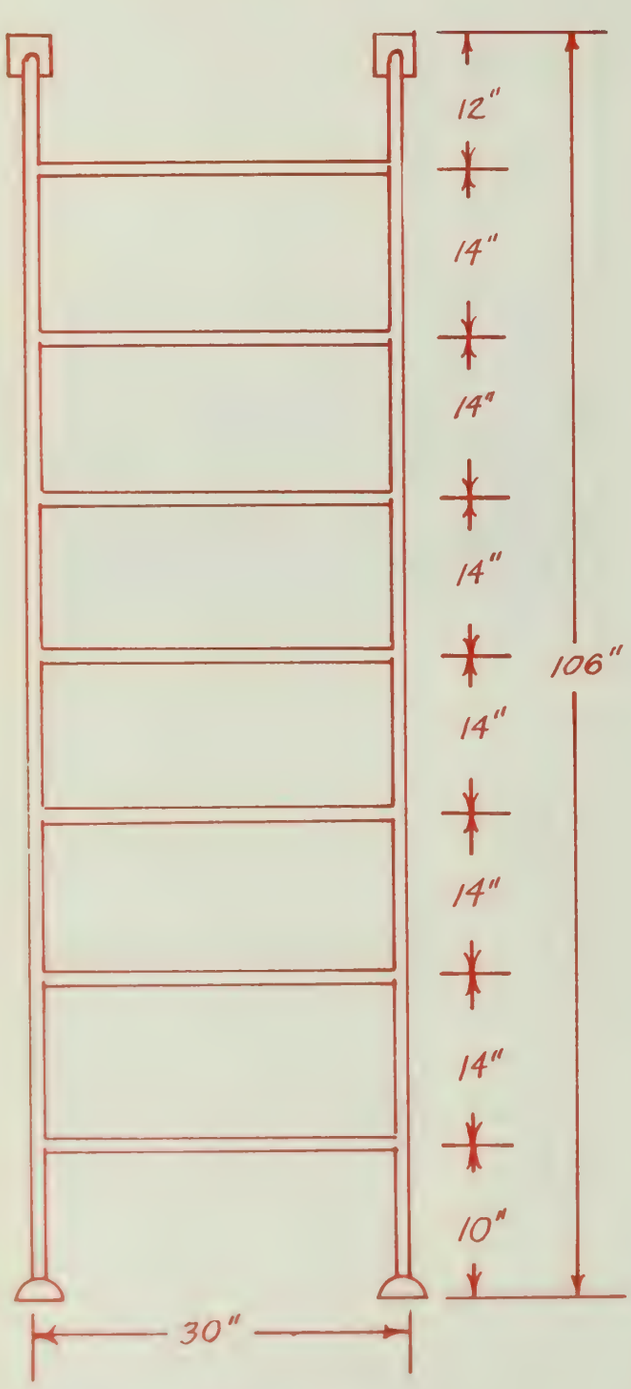
(3) Arming is accomplished only during takeoff and landing. (4) Once armed, the system is operable by anyone, but only from the occupant area. That is, the system is incapable of being armed and fired from a single location. (5) Dearming capability is provided in both the pilot's crew station and in the occupant section (the system may be de-armed from the occupant section, but not armed). (6) System status indicators must be provided for flight crew stations.

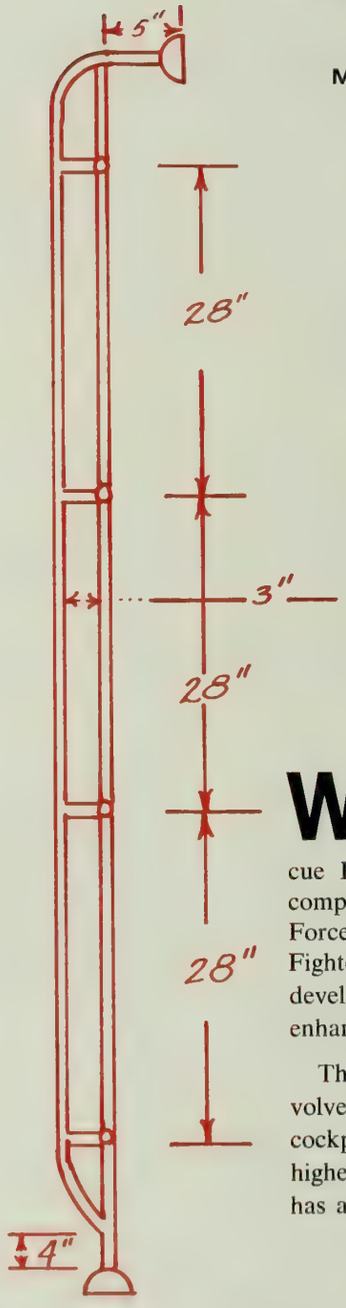
With these requirements in mind, it was decided to use an electromechanical safe/arm actuator. Thus, the device is fool-proof against any spurious inputs which may be encountered either during normal aircraft operation or during crash conditions.

Because of the inherent simplicity of the ELSIE system, crew training will consist primarily of familiarization and will emphasize the reliability of properly used explosive devices and their importance in safety applications in military aircraft. The responsibility for each flight crew member in actually triggering individual egress panels will be described and demonstrated.

Maintenance personnel need not necessarily be explosive ordnance trained; but they must be made aware of the existence and behavior of the explosive components that exist in this system. This includes routine replacement of warning lights and possible service to the control toggle switch. ★

ALUMINUM TUBING
FSN 4710-177-5911
(1" OUTSIDE DIAMETER)





LADDER SHOES ON BOTH
ENDS OF LADDER
FSN-5440-683-8992

SCALE 1/16=1"

RESCUE LADDER (A-7)

A-7D C

MAJ WILLIAM G. SHIDE
354 Tac Ftr
Myrtle Beach AFB

With the continuing emp
by the Directorate of
space Safety on Crash
cue Procedures, and faced w
completely new aircraft to th
Force inventory, the 354th Ta
Fighter Wing rescue personnel
developed a complete progra
enhance aircrew survival.

The first problem encounter
volved aircraft design. Witl
cockpit located well forward
higher than most fighters, th
has a telescoping access ladde

ASH RESCUE/PILOT EXTRACTOR



mally stored in the fuselage. Rescue operation using this ladder would be severely hampered, so a special lightweight ladder with protective "feet" and "pads" was developed to allow two or more rescuers access to the cockpit. The canopy locking and opening mechanism is intricate and finely balanced, so special instruction was required. A friction cutting saw (K-12) is required to enter the cockpit if the interdependent canopy downlock system becomes jammed. Seat safing instructions in the TO, while adequate for normal maintenance in a hangar, were deemed inadequate for aircrew extraction practice. A new checklist was devised and submitted for inclusion in the TO. This checklist insures that no "Murphyism" will cause an inadvertent canopy jettison or seat ejection.

A complete training program was developed providing initial indoctrination on the FTD trainer and Ground Egress simulator. Only then are neophyte rescuers allowed to take part in extraction exercises on the actual aircraft.

During exercises, protective mats for the sensitive canopy rails are used. A special non-skid "bathtub" mat precludes windscreen damage, and pilots are physically lifted only to the edge of the canopy rail. They then climb down the ladder, are placed on a fracture board, and carried a safe distance from the simulated crash site while receiving mouth-to-mouth resuscitation and heart massage. A resuscitator is available and used until the flight surgeon's arrival.

Hopefully these procedures will never have to be used, but if they are, the training and practice of the 354th Tactical Fighter Wing rescue section will add significantly to the pilots' chances of survival. ★

DOLLARS AND SENSE IN HUD HANDLING

HAROLD W. ROSENBURG, Naval Weapons Center, China Lake, Calif.

The AN/AVQ-7(V) Head Up Display (HUD) used in the A-7D/E is, in its present configuration, an inherently reliable and relatively trouble-free system. Yet, in spite of this, an unexpectedly large number of HUDs are still being turned in for repair or replacement.

Investigation of these units reveals that a distressing number of them have failed because of problems, such as broken fan wires, defective combiner glasses, torn night filters, broken microswitches, blurred symbology, and missing components and assemblies, which can be directly attributed to careless and improper operational and maintenance practices and rough handling. The following discussion covers the chief problem areas and concludes with a "horrible example" of what carelessness can do.

Item 1: The Display Unit (DU) Combiner Glass

The combiner glass is a vital part of the DU. In fact, it is the core of the entire HUD system, for without it, there is no HUD. So far, several dozen of these combiners have had to be replaced, at a cost per unit of $390, and a total cost of nearly $20,000. (This is a cost for material loss and excludes any additional labor costs.) And of course you have an unusable DU until a new combiner can be procured and the damaged unit replaced. It is suspected that most damage to the combiner glasses occurs because of rough handling during installation and/or removal of the DU from the aircraft.

Item 2: The Projection Lens System

There have been several cases of damage to the projection optics system of the display unit. For the most part, the reported damage consists of scratches on the coated projection lens. Sand and dust particles have been allowed to collect on the lens and, instead of being carefully removed either by being blown away or by being brushed off with a soft bristle (camel's hair) brush, they appear to have been ground into the glass.

Item 3: The Cathode Ray Tube (CRT)

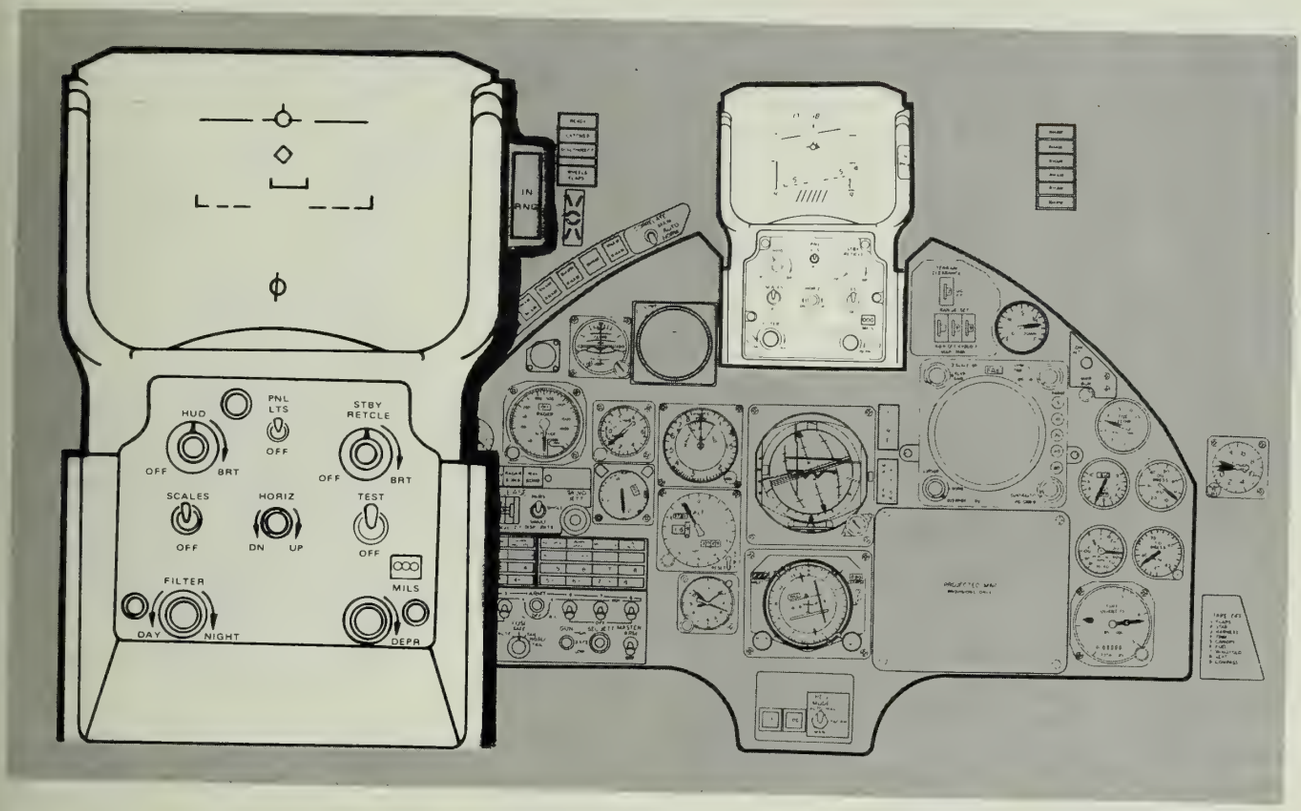
While the combiner glass and the projection lens system can be regarded as important passive components of the HUD's display unit, the CRT is one of its vital active parts. Two things common to the combiner glass, the projection lens system, and the CRT are the high cost of replacement and the need for improved operational and maintenance practices. At the present time, two types of CRTs are used in the display unit. One is a ceramic tube. Its individual replacement cost (excluding the necessary labor, such as focusing, alignment, etc.) is $1700. The other tube, a conventional glass type, costs $780.

Most of the CRT replacements have been made because of burned spots on the tube's phosphor coating. The cause of such burn spots has been traced to the rather neglectful practice of permitting the CRTs to operate at their maximum light intensity—or nearly so—for an excessive period of time. Applied analyses indicate that such phosphor burning effects did not occur during normal flight, where the symbology keeps changing with flight conditions, but on the ground, where a fixed pattern is displayed.

The obvious corrective measure is to avoid such conditions. Most important, operate the CRT at a lower light intensity, meeting the operational requirements rather than just turning the CRT light intensity control to its maximum setting and leaving it there. The operating life of these CRTs varies inversely with the setting of their light intensity controls, so by reducing light intensity, operating life can be greatly extended.

Item 4: The Signal Data Processor (SDP) Blower Motors

Broken SDP blower wires constitute the most frequent HUD problem. The blower wires and the SDP handle are in close proximity, and to the unwary or the quick-acting maintenance technician, the blower wires may appear to be a more accessible handle than the SDP han-



dle itself. The obvious result of this mistake is broken blower wires. (As an aid in preventing this, work is being done right now on designing a protective cover.)

A "Horrible Example"

To conclude with an illustration of what rough handling and careless maintenance practices *can* do to a HUD assembly, the following true report is repeated. Only the names have been omitted to protect the not-so-innocent.

Subject: Damage Report to Lens Housing Assembly S/N . . .

Line Replaceable Unit Serial No. _____ was received by the vendor from _____ military base on March 10, 1971. The following physical damage was reported:

1. The combiner glass was broken.

2. The microswitch normally attached to the combiner was missing.

3. The combiner cables were not secured.

4. The cover on the purging valve assembly was dented.

5. The EHT cable was not connected.

6. The cable designated 1A2J3 was not connected.

7. The night filter was missing.

The Lens Housing Assembly was rejected to the end item repair area. Upon further investigation, physical damage was noted as follows: When the top wedge was removed, the right field flattener was found broken away from the prism and the left field flattener was missing. The number three lens and prism were covered with fingerprints and Hylomar (a jointing compound used to seal the Lens Housing Assembly.) The night filter was missing, and the prism assembly carried evidence of the number three lens being pried away (scratches left by screwdrivers). The rear cell assembly had had the lens combination removed and reinstalled incorrectly, necessitating lens realignment. The left fiber optics had been damaged by persons trying to pull out the assembly and breaking the fibers. All the lenses were generally dirty and covered with fingerprints.

The mirror alignment had been disturbed and a large chip had been broken away from the mirror, which in addition was covered with Hylomar and fingerprints. The righthand mils depression shaft was bent. Fine metal filings were found in the bottom of the casting. The exit lens was scratched and required reblooming. The casing of the nitrogen purging valve was dented and required replacement. In fact, the entire unit would have required more than replacement cost to repair; so it was recommended that it be scrapped. Cost: thousands of dollars. 'Nuf said? ★

(Vought Maintenance Digest)

Blue two didn't feel good. In fact, he felt rotten. His head hurt like crazy, and that last pull-off from the range had set the little spots dancing in front of his eyes and almost cost him his breakfast.

"Well," he thought, concentrating on his join-up with Blue lead, "that's over. Let's go home and get out of this sweat-box!" He pulled into an easy route formation, concentrating on maintaining his position and wishing he could get more air through the cockpit vent system.

Passing ten thousand feet it was worse—much worse. His head had never hurt like this before, and the waves of dizziness that passed over him intensified his nausea. He had trouble keeping lead in sight, and finally punched the mike button to let lead know about it.

"Lead—Two. I'm kinda sick."

"S'matter, buddy?"

"Dunno, but I'm feelin' above-average bad. Take me home, huh?"

"Rog. You on 100 percent?"

"No, going there now." Two reached over and flipped the switch on his regulator.

"Hang on, buddy—have you home in a minute."

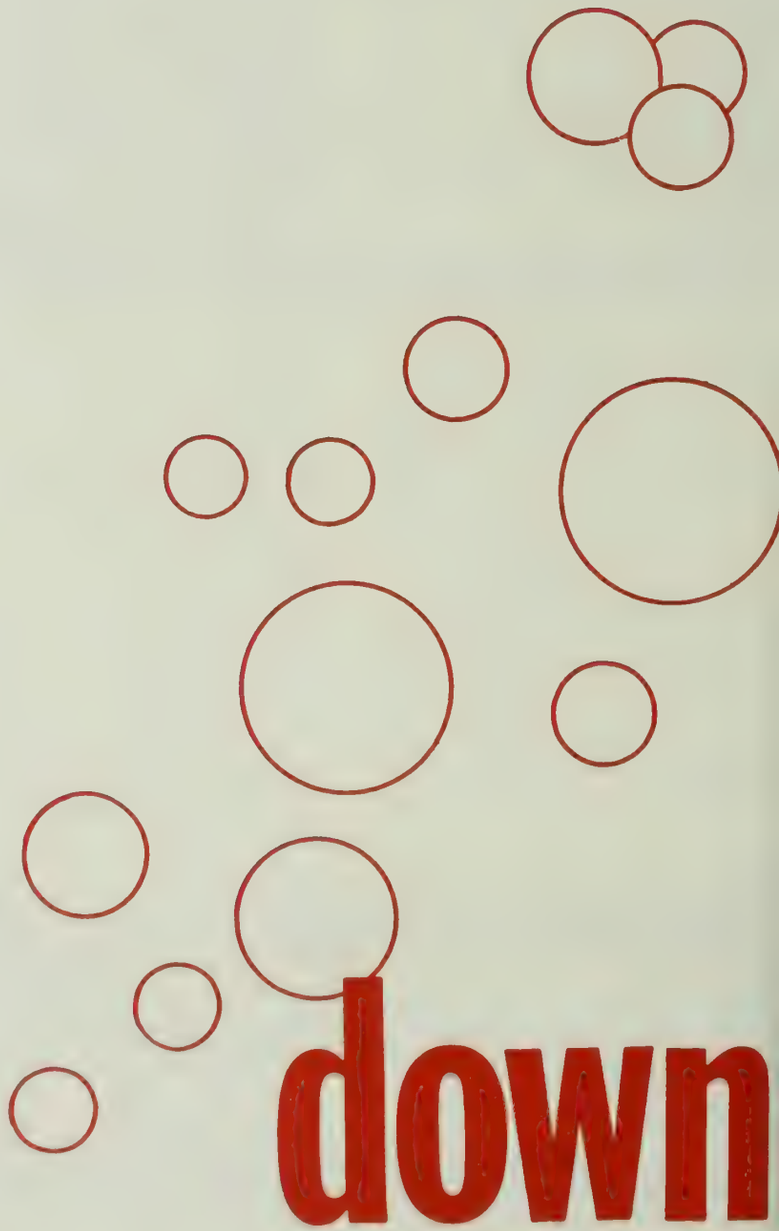
Two was an old head, and Lead knew immediately that the situation was of an emergency nature. He clicked to Guard transmit: "RAPCON, this is Blue lead on Guard. I have a sick wingman, and need immediate vectors to home base, with straight-in GCA. Squawking emergency."

The professional voice came back immediately: "Blue lead, radar contact. Turn left heading three-one-zero, descend at your discretion to four thousand. Expect precision radar approach, runway three-zero. Remain this frequency, we will coordinate for emergency equipment at landing."

"Rog, Blue flight turning left three-one-zero, level twelve-thousand, will call leaving."

Lead clicked back to company frequency. "Okay ol' buddy. Let's go over to Guard and I'll take. . . ." But Blue two wasn't there anymore.

Business as usual. Eight-thirty show for a ten o'clock go. On the range at ten-thirty, tanker rendezvous at eleven-fifteen, three nav legs and back on the ground just in time to miss the lunch-line at the club. The routine had the well-worn comfortable feel of a favorite pair of boots. Swig a coke while Frank briefs—sign the PIF—long, hot walk to the P.E. shop—chute and





and out

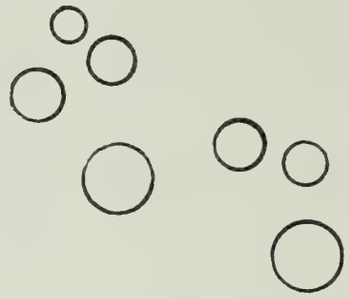
helmet off the rack—careful check of the mask and hose—on down the line to where the bird waits, primed, loaded and ready to go.

Man, it's hot! Radio check, engine start, checklist items falling away like those old movies where the leaves of the calendar go marching off in quick-step. Good thing we started early, gotta taxi all the way to the other end. Wow, that sun is something else!

What this country needs is a good $100 air-conditioner to keep the pilot cool while he's waiting for the arming crew to figure out that we changed runways! Here they come, finally! Always that ten percent. . .

These kerosene-burners sure stink when you're sitting downwind of them. Don't tell me we're ready to go! Rog, hold for traffic on eight-mile final—we could be halfway to Acapulco by the time he gets here.

OUT . . . *CONTINUED*



At last! Quick, take the runway before somebody changes his mind. Canopy locked, mask hooked—line her up, check her over, catch Lead's nod and awaaaay we go! Another on-time departure!

The noise is terrific . . . wind rushing . . . somebody talking in my ear . . . "Ed, get out of there! Eject!!" Reach for the handles . . . here somewhere . . . OOOF!

It's cool. White sheets. Quiet. Smell of disinfectant. Craggy face hanging over the bed.

"Good morning." The face had a deep voice. "How do you feel?"

"I'm not real sure. What happened?"

"We're hoping you could tell us. We've got a good idea, but need some confirmation from you. What do you remember?"

"Last thing I recall is, I must have passed out, and I heard someone, Frank, I guess, telling me to get out, and then it felt like someone punched me all over at the same time . . . and that's about all, until now. How long have I been here?"

"Just overnight. Rescue pulled you out of a tree, which probably saved you from being dragged. You've got some bruises and a scratch here and there, but we can't find much else wrong.

"Tell me about the flight—how'd you feel, what kind of symptoms were you having?"

"Lemme think . . . I guess they started in about the time we were leaving the range. Bad headache, dizzy, floaters in front of my eyes, nausea—almost made a mess of my new Nomex."

"Did they come on all at once?"

"No, I guess not. I was feeling great earlier—before the flight, I mean—but I guess that heat and sun got to me taxiing out. I was still okay—nothing I'd consider aborting for—but it just seemed to get worse as we went along. Was my oxygen bad?"

"Quite the contrary. In fact, if you'd been on oxygen for the entire mission I doubt that any of this would have happened."

"No joy, Doc. I was on oxygen the whole time."

"Not quite. When did you hook up your mask?"

"The minute we got clearance for takeoff."

"Uh-huh. But according to the other pilot, it took your flight about 20 minutes to get off the ground after engine start. In the meantime, you sucked up a lot of exhaust fumes."

"I remember—the fumes were bad, but it was so darned hot—you think that's what got to me?"

"No question about it. Your blood showed almost 20 percent carbon monoxide when we got you back here."

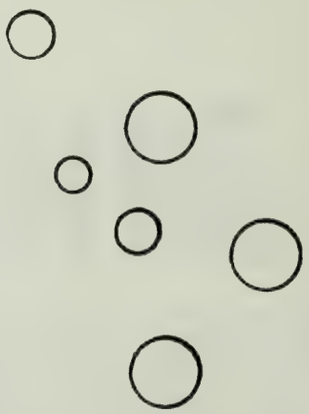
"How come it didn't get to me before takeoff?"

"Well, the effects of carbon monoxide depend on a lot of things. Mostly on how much oxygen the body calls for and how much oxygen is available. When you got to the range and went to work, your body started calling for more oxygen but your blood couldn't deliver. Then when you climbed to altitude the reduced availability of oxygen—which would normally have had a negligible effect—put the finishing touches on you. Almost literally."

Blue two leaned back on his pillow. There was a long silence while he stared at the ceiling.

"Well," he said, finally, "I'm grateful I'm still alive. What happens to me now?"

"Not much. We're going to keep you here for a few more days, just to make sure you're okay. Then you'll probably be back on the job. There's been quite a bit of activity down at the squadron, rewriting SOPs concerning the use of oxygen and such. And the boss is making sure the word gets out to everybody concerned—Air Force-wide—so maybe we can keep what happened to you from happening to someone else. If we can do that, that airplane won't be too high a price to pay."★



REX RILEY'S
CROSS COUNTRY NOTES



AIR CONDITIONING has become a generally accepted convenience in most of our transient quarters, but on the last outing we found quite a few quarters that had units installed but inoperative. Unfortunately, the bases we looked at were located in areas where the temperature doesn't cool off at night. If this is the case, then maybe some consideration should be given to sending the fellows down town.

PIREPS. Hardly a day passes without a message describing how this or that pilot found himself in a big hairy thunderstorm, which resulted in a flameout, hail and all the associated things that go on in one of those bears. Although the thunderstorm season is gone, it's time for all of us who fly to get in a habit that will pay big dividends, not only next summer but year round. If we would all make a practice of submitting a PIREP to the weather stations after or during each flight, it wouldn't be long until the forecaster would have an excellent picture of what the situation is throughout the country. As it is now, we estimate that less than ten percent of the pilots call metro while airborne for an unsolicited PIREP and fewer than this debrief after landing. The ole axiom "one eyeball is worth a thousand sweeps" is just as true in this instance as it is in the intercept business. That's why some commanders still employ the weather recce. The extra five minutes involved in this exercise could easily be the factor that decides a go or no go on an important mission where weather is a controlling factor.

NUMBER, PLEASE. We've hit on this subject before but it still is worth correcting. Although a minor irritation, how many times have you landed at a base, needing to make a phone call, but can't find a telephone book. Or, sitting in your BOQ, you think it's time to check on the progress of maintenance on your broke bird but can't find the number of transient maintenance. We still think that calling cards with a list of important numbers on them is well worth the small amount of money it takes to print them. ★

THE

REX RILEY
Transient Services Awar

RICHARDS-GEBAUR AFB
GRANDVIEW, MO.

LORING AFB	Limestone, Me.
McCLELLAN AFB	Sacramento, Calif.
MAXWELL AFB	Montgomery, Ala.
HAMILTON AFB	Ignacio, Calif.
SCOTT AFB	Belleville, Ill.
RAMEY AFB	Puerto Rico
McCHORD AFB	Tacoma, Wash.
MYRTLE BEACH AFB	Myrtle Beach, S.C.
EGLIN AFB	Valparaiso, Fla.
FORBES AFB	Topeka, Kans.
MATHER AFB	Sacramento, Calif.
LAJES FIELD	Azores
SHEPPARD AFB	Wichita Falls, Tex.
MARCH AFB	Riverside, Calif.
GRISSOM AFB	Peru, Ind.
CANNON AFB	Clovis, N.M.
LUKE AFB	Phoenix, Ariz.
RANDOLPH AFB	San Antonio, Tex.
ROBINS AFB	Warner Robins, Ga.
TINKER AFB	Oklahoma City, Okla.
HILL AFB	Ogden, Utah
YOKOTA AB	Japan
SEYMOUR JOHNSON AFB	Goldsboro, N.C.
ENGLAND AFB	Alexandria, La.
MISAWA AB	Japan
KADENA AB	Okinawa
ELMENDORF AFB	Alaska
PETERSON FIELD	Colorado Springs, Colo.
RAMSTEIN AB	Germany
SHAW AFB	Sumter, S.C.
LITTLE ROCK AFB	Jacksonville, Ark.
TORREJON AB	Spain
TYNDALL AFB	Panama City, Fla.
OFFUTT AFB	Omaha, Nebr.
ITAZUKE AB	Japan
McCONNELL AFB	Wichita, Kans.
NORTON AFB	San Bernardino, Calif.
BARKSDALE AFB	Shreveport, La.
KIRTLAND AFB	Albuquerque, N.M.
BUCKLEY ANG BASE	Aurora, Colo.

TECH TOPICS

KC-135 maintenance error

At the completion of an alert exercise which required "taxi only," the KC-135 pilot reported the reserve brake pressure low. Maintenance was notified of the discrepancy and a hydraulic specialist dispatched to the aircraft.

The hydraulic specialist quickly determined that the reserve brake accumulator was defective and would require replacement. Permission was granted to remove the aircraft from alert status, and the aircraft commander released it to maintenance.

The accumulator was replaced and the system operationally checked by running number one engine. After this maintenance was complete the crew chief boarded the aircraft to close the left main gear well door. With electrical power applied, he pressurized the left hydraulic system with the auxiliary pumps. After about one minute, the gear doors had not closed. The crew chief, remembering a trick he had been shown by another crew chief, raised the gear handle in an attempt to get the doors closed . . . followed by that sudden, sinking feeling as the nose gear collapsed.

Damage to the aircraft came to 1500 manhours and $16,000. The primary cause of this accident was maintenance in that the crew chief raised the gear handle. However, there were several deviations from tech data leading up to the accident: the aircrew failed to install the gear pins as required by the uncocking checklist; maintenance personnel failed to install the pins prior to any maintenance being performed in accordance with TO 1C-135KA-2-4-1 and 1C-135KA-2-3; the supervisor allowed maintenance to be performed without insuring that proper precautions were taken; and the crew chief went well beyond authorized procedure with his "home remedy" for closing the gear doors.

RF-4C chafed oil line

After approximately one hour of flight, the number one engine nozzle failed to the full-open position, followed shortly by a generator failure light and zero oil pressure. The engine was shut down, an emergency declared and a return to base was completed without further incident.

Maintenance found the low pressure oil scavenge line cut and frayed. The support clamp asbestos lining was badly compressed and worn away. The exposed metal of the clamp was worn to a fine edge from rubbing against the steel-jacketed line and continued vibration had caused the clamp to cut through the line. The clamp was the correct type and size as specified by the technical order.

Excessive wear of the asbestos lining indicates that the clamp was either badly worn when installed or it was loosely installed.

engine installation

Recovering from an air combat maneuver in which 7.2 positive Gs were registered, the F-4 pilot heard a loud thump. All engine instruments and handling characteristics remained normal.

Postflight inspection revealed that number two engine had dropped approximately two inches into the engine bay. Further inspection by maintenance personnel and the investigating officer found that the top forward engine mount (skate mount) had been improperly torqued during the last phase inspection. Improper torqueing of the skate mount, ag-

gravated by G forces, caused the mount to fail, which allowed the engine to drop into the engine bay.

The solution to problems such as this lies in first class supervision and well trained, conscientious people who follow the TO.

arming area goof

Two F-4Es were armed for a night tactical mission. The preflight, start, and taxi to the arming area were uneventful. As number two approached the arming area, the flight lead was moving forward after the tire check. Number two then passed behind lead and into the arming area. As the ground crew moved under the aircraft, the pilot felt a thump and the ground crew advised him to shut down the engines as they had detected sparks coming from the number two engine exhaust.

Investigation later revealed that a wing tank safety pin had been ingested into the number two engine. However, all arming pins for both aircraft in the arming area had been accounted for. This led investigators to conclude that the ingested pin was left on the ramp from a previous aircraft. This leaves the reader wondering—why isn't the ramp cleared of FOD between missions?

(AIRSCOOP, Sep 71)

pressurization problems

On initial climb the aircrew noticed their WC-135 was not pressurizing in the automatic mode. The aircraft was leveled at 10,000 feet and pressurization obtained by using the manual mode. The climb was continued and the system failed again at 11,500 feet. The mission was aborted and the aircraft returned to base.

Maintenance found two lines to the pressurization controller crossed. This would render the automatic mode inoperative. The discrepancy was corrected and system operationally checked okay. The aircraft again departed.

Approximately 45 minutes into the second flight at 25,000 feet the pressurization failed again—in both auto and manual modes.

This time the maintenance team found that the two rubber lines to the pressurization controller had the coil spring inserts missing. These inserts prevent the lines from collapsing during pressurization cycles. A review of the aircraft records indicated a history of pressurization malfunctions on this aircraft dating back eight months. Evidently the spring inserts had been missing for this period.

All environmental system personnel were briefed on these incidents and the personnel directly involved scheduled for remedial training.

intake inspection

The EB-66 returned from flight with constant speed drive problems on the number one engine. During the course of maintenance the alternator was removed, the constant speed drive was removed and replaced and the alternator was reinstalled. Both CSD and alternator system checked good during engine run.

Inspection of number one engine inlet after shut down revealed extensive damage to visible rotor and stator blades. Investigation of the engine inlet area did not reveal any missing hardware. The type of foreign object is not known, but a hard metal object is suspected. The engine specialist and the crew chief both stated that the intake area was inspected with a flashlight prior to engine run. However, no entry was made in the Form 781 to reflect that this mandatory inspection had been accomplished. Primary cause was undetermined, but most probable was maintenance personnel factor in that the required intake inspection was not properly accomplished prior to engine run.

parking problems

An airman had four years' experience operating fork lifts—two and one-half of these years in warehouse type support. On this particular day he was driving a 4000 pound fork lift with an automatic shift. Using his fork lift to carry a warehouse cart containing numerous supply items, he drove into a warehouse and lowered the cart in an aisle. Then he backed the fork lift away about five feet, and dismounted to help his buddy push the cart to the side of the aisle. Looking back over his shoulder, he saw that the fork lift was following him.

The driver yelled to alert his buddy and attempted to stop the fork lift. But too late—he couldn't prevent the forks from striking his buddy's left leg and pinning it against the warehouse cart. He then remembered that he had not set the parking brake, nor had he lowered the forks to the floor. One thing he did do, however, was to leave the engine running.

CONTINUED

Two contributing maintenance factors influenced the actions taken against the driver. It seems that during repainting, all directional markings for the fork controls and directional shift lever were painted over. Also, it was found that there was excessive play in the gear shift linkage. Nonetheless, there is a proper way to park a fork lift, as our experienced operator was officially informed.

(AIRSCOOP, Sep 71)

TECH TOPICS

engine eats static wire

The crew chief of an F-104G was performing an ops check of the engine prior to functional check flight. After running the engine for approximately 20 minutes, he heard an unusual noise and shut down to determine the source. It didn't take long to discover the cause of the unusual noise. The static ground wire, with streamer attached, had been drawn into the intake.

The crew chief stated that he had disconnected the ground wire from the forward attachment point and had laid it three feet in front of the intake prior to entering the cockpit.

wheel failure

While taxiing for takeoff, the C-123 crew heard a loud crack and felt the aircraft settle to the left. The crew shut down the engines and deplaned to find that a 180 degree section of the left outer wheel rim had separated.

It was discovered that this unit was not conducting an NDI of the wheels during tire buildup as required by TO 1C-123B-6. This wheel showed evidence of a preexisting fatigue crack. Had the required NDI been performed, this crack would have been detected prior to failure.

Procedures have since been established in this unit to comply with the Dash 6 requirements.

How about it, QC, are the requirements of the Dash 6 being complied with during wheel and tire buildup in your organization?

Murphy strikes again

Murphy got a chance to show his stuff when two young airmen had to be checked out on how to inflate an aircraft tire.

"Simple enough," said Murphy, "grab your hats, get me a tire gage and I'll meet you at the aircraft." Since everyone knows one tire gage is as good as another, Murphy didn't see any reason to check it for serviceability before directing his helpers to inflate the tire. On the first try, the airman couldn't read any pressure on the gage, so he asked his buddy to connect the hose again and give him more air. After checking the second time and seeing only 80 psi on the gage, he asked for more air again. About that time, the wheel exploded tearing the hub in two. Both airmen were killed instantly.

This tragedy did occur, although in another branch of service. It is a grim warning to those who disregard the use of TO procedures and a gruesome reminder to all who permit faulty equipment to remain in service.

(5 AF Safety Bulletin)

aye, that's the rub

During trouble-shooting of flight write-ups on the navigator's altimeter and true airspeed indicator, maintenance men found the static line to the navigator's instruments leaking. The line had been cut as a result of chafing against the elevator control cable. The inflight effect was altimeter readings up to 3200 feet in error and true airspeed as much as 100 knots low. In addition the static line to the copilot's instruments was being chafed by the aileron cables. It was determined that the static lines had been improperly positioned during modifications.

A one-time inspection of all RC-135 aircraft assigned to the unit revealed one other aircraft with the same discrepancy at the navigator's station. Also, approximately five inches forward of station 400 a bolt securing a clamp was chafing the elevator control cable. Another unit inspected 31 KC-135A aircraft and found eight incidents of elevator cables chafing static pressure lines.

Chafing of static lines is a hazardous condition. Even more serious is the chafing of control cables. Fortunately, the static lines failed prior to the control cables. It would appear that quality assurance was at fault. Quality control must have been looking the other way when these birds rolled out of the mod line.

tech data again

Two T-28s, in different parts of the world, landed gear up within the same week when the pilots could not get the gear down. The cause was the same in both cases.

A bolt (Part No. AN173-11) connecting the gear actuating rod to the clevis assembly (PN 159-34412) was installed backwards and jammed against the nose gear brace bolt. This prevented the gear from lowering.

Obviously those maintenance men responsible worked from memory rather than follow the tech data. These two incidents emphasize the necessity and importance of using the TO during maintenance.

T-37 speed brake

Following a stall recovery the speed brake failed to retract. A visual check by another aircraft verified that the speed brake was down and hydraulic fluid was leaking from the right actuator. An uneventful straight-in landing was accomplished.

The right hand actuator rod turned out to be one-half inch shorter than the left rod. With this incorrect adjustment, every time the speed brake was actuated extra stress was applied to the actuator attaching bracket. This increase in stress caused the bracket and attachment screws to fail.

How did the speed brake actuator get out of adjustment? Somewhere there is a maintenance man who knows the answer.

a villainous B-Nut

Just as a T-38 was taking off during a touch-and-go landing, a loud bang was heard. The takeoff was continued. However, the gear would not retract, both engine fire warning lights came on, the flight controls became unresponsive and the crew ejected. The fire resulted from a fuel leak at a fitting on the variable guide vane actuator fuel inlet port. A "B" nut was improperly torqued. Hooking up the fuel lines so they don't leak is one of those things that just has to be done right. The "B" nuts must be torqued and inspected properly. If they're not, they will leak. If they leak, there will be fire, and if there's fire, airplanes will be lost and people may die.

light FOD

During the inverted portion of a clover leaf, the control stick of a T-38 froze in the pitch position. The aircraft was rolled to wing level with the ailerons, and by applying 20 to 30 pounds of pressure to the control stick, the pilot was able to level the aircraft. Any pitch movement of the stick from there to landing required extra pressure and the stick would remain in the new position selected. A straight-in full stop landing was accomplished.

A rechargeable flashlight was found jammed between the cockpit floor and the flight control bob weight connected to the rear stick.

All aircrew and maintenance personnel must realize the importance of reporting and locating all items lost aboard aircraft prior to its release for further flight.

slippery hands

During upload of an AIM-4D missile, the missile was positioned at the left inboard station and was being aligned with the aft attachment lugs when the nose slipped from the team member's hands. Impact damage to the missile was extensive, costing over $8000.

Cause: The team member's hands were covered with a residue of hydraulic fluid. The combination of hydraulic fluid and a moderate rain caused his hands to become extremely slippery and he simply couldn't maintain his grip on the missile.

Cleanup goes hand in hand with any job. In this case, cleanup before the job was started should have been assured by the load chief. It is the responsibility of all supervisors to identify potential safety hazards and take corrective action immediately. ★

HOW MANY BARS?

How many bars are there in a VASI system? Normally the Visual Approach Slope Indicator (VASI) will show you a "near" and "far" bar on each side of the runway. The system is usually lined up with the GCA and/or ILS glide slope. It's a fine approach aid day or night. If you happen to be landing Runway 6 at Montego Bay, Jamaica (!), you'll see three bars on each side of the runway. The extra bars, farther down the runway, are for 747 and C-5A types. Los Angeles International is another airfield scheduled to get extra bars soon. Installation at other airports will follow. So whenever you see a three bar system and you are not in a C-5, use the near and center bars. The significance of the red and white colors is the same:



OVERFLIGHT | O.K. FOR C-5 | O.K. | CRUNCH!

After landing, the choice of bars is yours.

(NOTE: Light aircraft types can stay high on the normal glide path by using the jumbo-jet glide path—maybe avoid some wake turbulence.) ★

Adapted from Maxwell/Gunter All Safe.



THE TRAVELING MAINTENANCE MAN

SMSGT HAROLD MOORE
Directorate of Aerospace Safety

Right off the bat I want to tell you this article is for you traveling maintenance types. I don't mean just aircrew members, but also those of you who occasionally have to go TDY to Boondock AFB to make an engine change, repair a hydraulic leak, or what-have-you.

I know from several years experience that a TDY can be a smooth operation or, on the contrary, a frustrating experience, depending on the service and support provided by the host base.

If you have read the Rex Recommends column appearing in this magazine each month, you are aware of the continuing efforts being made to improve the lot of the transient aircrew. This same effort applies for us all, including those who travel only occasionally.

Let's say you have driven to Boondock AFB and are checking in with Transient Alert. They should be able to bring you up to date on the aircraft involved and what maintenance has already been performed. They should give you a brief rundown on local maintenance procedures. Bases vary as to runup procedures, getting the bird in and out of the hangar, etc.

Maintenance control should be notified of your arrival by Transient Alert. Establish coordination between your team chief and the control room for specialist support (if needed) and AGE. Maintenance control should make any necessary arrangements for transportation and communications.

Next on the list are billeting and messing. We don't want tired and hungry men working on our birds. This brings to mind an incident that occurred a couple of years ago. A young sergeant was selected to drive to Boondock AFB—about 200 miles away—to repair a hydraulic actuator on a grounded aircraft. The sergeant had been on duty about six hours when he was instructed to drive to Boondock. He was to get quarters for the night, repair the aircraft the next day and return home. All went well until the sergeant arrived at the billeting office about 2300 to find the man behind the counter appearing to be more tired than he. There were no quarters available and the clerk didn't know anything about the situation down town. The sergeant asked him about chow. He wasn't any help there, either. There was a night mess but he didn't know the hours. The clerk settled a little deeper into his chair as the confused and frustrated sergeant left. Outside a couple of airmen gave the Sarge directions to the night mess.

Being unfamiliar with the local area and remembering that the closest town was about five miles back up the road, the sergeant chose to spend the night on the seat of the pickup. After a few hours of aching, tossing sleep, he reported to the transient alert section, repaired the faulty actuator, assured the pilot the bird was A-okay and headed home —dead tired.

There is no excuse for the type of treatment this man received. Had the desk clerk been alert and responsible, he would have been able to direct the sergeant to the mess and would have had some knowledge of off-base quarters. A short phone call to a local motel to confirm a vacancy means a lot to a tired individual in a strange area.

Then there are those annoying cases such as that of a T-29 flight engineer who has just put his bird to bed and arrived at the transient airman's quarters. He finds himself in a four-men-per-room situation. To make matters worse, the rooms are hotter than the flightline ramp. Perhaps this man is a little better off than the sergeant who slept in the pickup, but not much.

Now, what can you do about situations like this? Write to Rex, in care of this magazine, giving your comments as to the conditions of the transient airman's quarters, messing facilities, and the service in general, as you tour bases away from home. Be sure to tell about the good as well as the bad. Here's the address:

Editor, Aerospace Safety Magazine
Dept IG for Insp & Safety (IGDSEA)
Norton AFB CA 92409. ★

straight talk about how maintenance can help itsel

HEY, SARGE!

JAMES H. SMITH
SAAMA
Kelly AFB, Texas

You and I have a problem. Like every problem, if it's to be solved we troops will have to solve it. Otherwise, a lot of sweating and knuckle-busting will be necessary to get the job done.

The problem is poor quality of some supply items. To keep the problem in perspective, most of the items you draw from supply are good. Comparing the number of Quality Unsatisfactory Materiel Reports (QUMRs) that have been submitted with the number of line items shipped, less than one-third of one percent of the items shipped from SAAMA (and we ship nearly two million per year) are bad enough for a report. As long as the items shipped are about 99.7 percent pure, we can't afford to go to the warehouse and inspect everything to find the problem items. We would break more supplies than we would fix.

Most of us who work in the Quality and Reliability Assurance Office have worked on the line, and we are well aware that it doesn't take many bad items to deal you some real misery. You need supplies that are 100 percent good all the time, and it is our job to see that you get them.

To assure that you will get good items, we test some, we provide for quality assurance tests at the time items are bought, we even take a few samples out of the warehouse and test them. We can't afford to eat the whole apple to find out if it is rotten, though. There comes a point where it is better to spend the available money for more supplies rather than for more inspections.

You will give every item the acid test of using it, and if we can learn from you where the remaining quality problems are hiding, we can take corrective action. However, the present system of defect reporting doesn't always succeed in correcting the problems you report. Here are some reasons why:

The procedure for reporting quality defects is to submit a Quality Unsatisfactory Materiel Report (QUMR, DD Form 1686). This same report form is used for several other purposes besides quality defect reporting, and by several other services besides the Air Force. So, the form is a compromise. Some of the labels on the blocks are not compatible with the Air Force system; therefore, TO 00-35D-54 tells you what to enter in each block.

Please note that the information requested by TO 00-35D-54 does not agree exactly with the block titles on the DD Form 1686. In order to correct your quality problem we need the information called for by the TO, *so please follow the TO instructions!*

In the past ten months we have reviewed more than 800 QUMRs. A whopping 80 to 90 percent have errors on them. The three most common bloopers have been:

(1) Distribution of the completed report to the *wrong* office(s). Under









the tight deadlines we work to, misrouting the action copy practically guarantees that you will turn in the exhibit before we can get our hands on the report and arrange for an exhibit request. This results in loss of the exhibit. Since TO 00-35D-54 was revised in January 1971 to simplify and clarify the QUMR distribution, this problem cannot be blamed on the TO or on the form. The solution should be obvious.

(2) Required information is frequently omitted. This happens on a third of the forms in Block 30; and to a lesser percentage in other blocks. Since the information omitted from Block 30 is your own phone number, the reason is obvious—you aren't reading TO 00-35D-54 to find out that your phone number is required in Block 30! We need that phone number to discuss questions that come up, to obtain additional information, and generally to expedite action to correct the problem you reported.

(3) Contradictory information as to which manufacturer or SRA caused the defect. Both Block 7 and Block 22 are defined by TO 00-35D-54 as the agency that "accomplished the repair or manufacture of the item." Since only one agency can meet this definition, these blocks will obviously list the same contractor or SRA. Block 19 will be the Federal Manufacturer's Code for this same agency. (Yes, Sarge, there *is* a Federal "Manufacturer's Code" for each SRA. The code for SAAMA is 98750). The TO is being rewritten so that the name, address, and FMC will all be put in Block 7, and Blocks 19 and 22 will be marked NA. What is important is that one, *and only one,* responsible agency be completely and positively identified on each QUMR.

By now a picture of the reports we have to work from is emerging. Too often the QUMR arrives late because it has bounced all over the country looking for a home and the exhibit has been turned in to supply before we can catch it. Required information is missing and basic information on the face of the form is contradictory. As a result, *about half of the QUMRs we receive cannot be supported well enough to prove the defect occurred and definitely identify the contractor or SRA responsible.*

Here are some specific things you can do to help us furnish good supplies:

(1) Use TO 00-35D-54, TO 00-25-115, and the checklist published on pages 17 and 18 of TIG Brief 11, 1971, when you prepare a QUMR. If you have further questions call us Autovon 945-6868 or Area Code 512 + 925-6868 and we will be glad to help you.

(2) Send photographs of the defective item showing the defect and copies of photos of identifying tags and decals. Remember, we cannot tell you to ship the exhibit before the contractor agrees to do whatever work is necessary at no cost to the Government.

(3) If you don't think our reply to your QUMR is reasonable, follow up right away and tell us what is wrong with it. With further information we can sometimes get a better response.

(4) If the problem you are considering isn't worth the effort it takes to file a one-page report and send a few photographs, do yourself (and us) a favor and forget the whole thing. When you do have a problem you think is worth reporting, give us an accurate, complete report with enough supporting photos and documents to give us a fighting chance. ★



T-BIRD FLAMEOUTS (REVISITED)

The pilot estimated that they were in rain at FL250 for two-three minutes when, with no indication of trouble, the engine flamed out. The pilot selected idle and gangstart, and restarted the engine at FL240 with no problem. They landed without further incident.

A fuel sample from the fuel source revealed no discrepancy, nor did a Dash-Two postflight reveal anything that might have caused the flameout. Great Mystery! Except that T-Birds have experienced numerous flameouts while cruising at a constant power setting in precipitation above freezing level. Pilots should avoid that unhappy combination whenever possible.

(For a thorough discussion of this problem, refer to *Aerospace Safety*, April 1971, "T-Bird Flameouts.")

DISTRACTION/DESTRUCTION

A STOL aircraft usually has a lot of runway left in front of it when it breaks ground. This is not normally a problem; however. . . .

Right after the Caribou broke ground, the upper escape hatch blew open. (Much noise—something like the effect of an alarm bell and red light in the cockpit.) The pilot still had about 3000 feet of runway left and elected to set the bird back down. He touched down smoothly 4700 feet down the runway and slid to a screeching stop—gear up.

The open escape hatch provided the necessary distraction—enough, apparently to divert the pilot's attention from the task at hand. (Note: the escape hatch was improperly secured—a condition which would have been prevented by proper attention to pre-takeoff checks.)

It was recommended that the unit directive to "land immediately" in the event of a malfunction should be clarified. Surely not that many of us need to be told to put the gear down first.

Interestingly, a look in the book showed that sliding distance was considerably more than that required for normal landing with brakes and reverse thrust available.

Ops topics

CLOSE, CLOSE!

The T-29 was on a local IP upgrading mission. During closed traffic the flight engineer left his seat for a few moments; when he returned, RPM and flaps had already been set to approach setting, so he turned the landing lights on and called the Landing Checklist. On short final the IP noted that the approach lights were bothersome and asked that they be turned down. Returning his attention to the cockpit he saw for the first time that the gear indicated up!

About this time there must have been a fast three-handed game of seeing who could shove the throttles the fastest and farthest. The crew completed a successful go-around and, since there was no indication that anything was wrong, they went ahead and completed this mission. After landing, maintenance found that all three blades on number one prop had been ground off one-quarter to one-half inch!

Sure enough, the gear warning horn and light were way out of adjustment. Even more sure is the fact that no one called for the Before Landing Checklist. And that simple omission led this crew about as close as you can get to dinging a bird.

Many aircraft include a re-check of the gear in the Landing Checklist; this might be a worthwhile addition to the T-29's. In any event, a re-check of the gear on short final should be a part of every pilot's (copilot's/flight engineer's) technique.

WHO PICKED THIS PATCH?

The fighter unit was deployed to an island airfield belonging to an allied country. Conditions were known to be somewhat less than perfect, and, with the parallel taxiway closed, the standard procedure was established to taxi down the active and make a 180 into position for runup and takeoff.

Just prior to making his 180 at the end of the runway, one fighter taxied into a hole where the taxiway joins the runway. The hole was about three feet by four feet by one foot deep; the center of the hole went to a depth of three feet.

When the right main gear hit the hole, the right drop tank struck the runway and was ripped from the aircraft; the right main tire failed from the impact; and the left drop tank broke off due to the shock of impact.

Two small red warning flags, put out by the allied owners of the field to mark the hole, had blown over and were not in place at the time of the accident. The hole was marked only by a painted yellow outline.

The parallel taxiway had been NOTAMED closed for some time. No mention was made of the hole, however, and *none of the deployed personnel were aware of its existence.*

We can't help wondering if an airfield survey were run prior to deployment to that airfield. If not, there certainly should have been. And it's obvious that a continuing survey is needed to keep up with the airfield status.

T-BIRD POP-TOP

Shortly after takeoff, the front-seater noticed that the canopy locking handle was not in the locked position. He advised the back seater of the problem, then attempted to lock the handle. When he did, the canopy departed the bird in a great rush of noise, dust and windblast.

They got the bird back down okay, and neither pilot was injured. Investigation showed no discrepancy in either the mechanical overcenter locking system or warning light and microswitch. Downlock adjustment was within tolerance. No evidence of any unlock or release was found.

Preventive actions included:

(1) A challenge/response system of canopy check;

(2) Painting an aligning mark on the canopy rail to indicate downlock interconnect rod position to the pilot in the aft cockpit; AND

(3) Renewed emphasis on *actually accomplishing checklist items.*

FLIP CHANGES

Addition to Part II FLIP Planning:

The September issue of the Flight Planning Document Section II, North and South America and Europe, contained instructions for completing the Department of Defense International Flight Plan (DD 1801). These instructions appeared in the October issue of the Pacific Section II. NOTE THE MANDATORY ENTRY IN ITEM 18 UNDER OPR. FAILURE TO MAKE THIS ENTRY MAY RESULT IN A USER CHARGE AGAINST THE DOD.

Aircrews also note that four-character identifiers are used in international flight plans, e.g., DD 1801, and three-character identifiers are used in the domestic flight plans, e.g., DD 175. If the supplement shows a four-character identifier the first letter is not used in the DD 175.

Expansion of Positive Control Area (PCA):

Effective 0901Z 14 October 1971 the balance of the conterminous states PCA will be lowered to 18,000 feet excluding the Santa Barbara Islands, the Farallon Islands and that portion south of latitude 24° 04′ N. As a result, effective 14 October 1971 symbols for the PCA will be removed from the FLIP Enroute High Altitude Charts.

SOME STARCHY SUIT!

Some aircrew members, eager to look sharp in their new Nomex flight suits, starched them. This was before they read the warning tag inside the suits which reads, "Do Not Starch. Starching will destroy the flame resistance." (When all else fails, read the directions.)

In some instances, the starched flight suits were then discarded, in the mistaken belief that the suits were no longer fire resistant. Not so, advises AF Systems Command Headquarters: Nomex is permanently fire resistant—only the starch will burn. Launder the starch out of the suit and it will be as fire retardant as ever.

Ops topics

CONTINUED

A flight surgeon met the aircraft on its return, in order to take blood samples as quickly as possible after the incident, but neither these nor a physical examination of the pilot showed any abnormality.

Examination of the pilot's oxygen equipment revealed two holes, one at each end of the hose. The pilot stated that he had performed a visual inspection of his equipment prior to flight, and had completed all PRICE/ oxygen checks in the airplane. It's possible, of course, that the holes were poked in the hose during the flight. It's a lot more likely, though, that that particular pilot will be more careful when he checks his equipment from now on. ★

WHEN YOU GOTTA GO..

A tragic accident darned near happened recently when an F-4, cleared for a full stop landing, decided to go around and nearly creamed a helicopter which had been cleared across the active for a landing on the taxiway. Tower showed signs of consternation at not having been advised of the F-4's intent to go around. The helicopter pilot was downright perturbed.

Now, there's no denying the basics which keep us alive; the old maxim, "If it doesn't look right—take it around," has kept most of us out of a bad situation. There's a lesson to be learned here, however.

1. When you're cleared to do something, do it . . . UNLESS:

2. UNLESS: some important consideration dictates otherwise (such as the continued good health of old Ish).

3. IF you deviate from clearance (for the aforementioned good reason) TELL SOMEBODY!

OXYGEN DISCIPLINE

During an instrument training mission, the student began to feel a tingling sensation in his hands and feet, then an unusual sensation of warmth over his entire body. Recognizing his symptoms as hypoxia, he went to 100 percent oxygen, which cleared his symptoms.

T-BIRD BURNIN'

Engine shutdown appeared normal, and both pilot started getting out of the aircraft. At that moment th crew chief yelled, "It's on fire! Stopcock it!" The fron seat pilot confirmed starting fuel and throttle of Meanwhile, fuel continued to drip below the aircraf the EGT reached 1000 degrees and the crew could se fire in the tailpipe. Both pilots left the bird in a hurry and an alert crew chief jumped into the front cockpi turned on the battery and turned the main fuel shuto switch to OFF. The fire went out immediately.

Some after-incident experimentation turned up th fact that very little pressure on the aft throttle move the front throttle forward in the stopcock range— which admits fuel to the engine. The forward throttl looked like it was stopcocked, but had in fact move forward one-half to three-quarters of an inch. Be guess is that the rear seat pilot nudged the throttle fo ward with his knee when he stood up to get out.

The front seat pilot was not in the habit of tightenin the throttle friction after shutdown (as required by th T-Bird Dash-One). Other T-Bird types should tak note.

And thanks be to an alert crew chief, for saving valuable piece of machinery.



Toots

is interested in your problems. She spends her time researching questions about Tech Orders and directives. Write her c/o Editor (IGDSEA), Dep IG for Insp & Safety, Norton AFB CA 92409

Dear Toots

I would appreciate further clarification in regard to oxygen servicing in TO 00-25-172, para. 4-1 and 4-2. I feel that besides a person being AFTO Form 35-qualified, he should have technical data in hand to familiarize himself with the type of system, precautions and instructions for handling oxygen, and potential hazards involved. I believe gaseous oxygen servicing is not a simple task and should require technical data. What is your opinion?

TSgt R. G. Rawson
Nellis AFB, Nevada

Dear Sarge

Although paragraphs 4-1 and 4-2 of 00-25-172 do not specifically state that the individual servicing oxygen will have the TO in hand, I believe the Air Force has made it perfectly clear that tech data will be used during all servicing, and I interpret this to include oxygen.

Gaseous oxygen servicing will only be a simple task when the checklist is followed. Oxygen itself is not flammable but will support combustion in other flammable materials. If oxygen is permitted to mix with flammables such as fuel and lubricants, the result can be highly explosive.

I suggest you bring the contents of AFM 127-101, para. 0802.18, to the attention of anyone who thinks servicing oxygen is a simple task and that no tech data is required. This paragraph describes the hazards involved with oxygen servicing and also lists several TO references that should be of interest.

Toots

Explosives Safety



Color it Loaded

GORDON S. TAYLOR, Directorate of Aerospace Safety

Primary cause, supervisory factor on the part of the aircraft munitions loading crew chief in that he did not follow the loading checklist, and did not demand strict compliance with all checklist procedures from every member of his crew. Contributing causes: (1) Supervisory factor on the part of the shift supervisor in that there was an obvious disregard for the proper use of checklists, (2) personnel factor—the number two man deviated from the checklist procedures, (3) personnel factor—the number four man deviated from the checklist procedures.

The above was taken from a report on an explosives accident in which a 20mm gun was fired inadvertently. Mishaps like this will continue to occur unless strict enforcement of the use of checklists by all concerned is assured.

If you are a supervisor, remember that being a good guy also requires you to protect your men—often without their eager support. If you are a worker, support your supervisor and comply with directives. The number four man mentioned above didn't. He was a fatality.

This item had hardly cleared the typewriter when another man was injured in a similar accident. He was hit in the groin when an M-60 machine gun fired while the de-arm crew was working on the gun.

Further checking revealed that another man was shot in the foot while working with a 7.62mm gun. Obviously there is a need to tighten up in this area. Supervisors and explosives safety types can help, but the individual working with the equipment has a like responsibility—and a greater interest, it would seem, since he probably will be the one to suffer from any goofs. ★

EXPLOSIVES SAFETY AWARDS

The July 1971 *Aerospace Safety* magazine proclaimed that awards will be established in AFR 900-26 for outstanding units contributing to *explosives safety*. Suggestions for a distinctive emblem, to be portrayed on plaques presented to award winning units, were received from the field. Judges have reviewed these suggestions and made their decision. Their selection is a simple flash of lightning, symbolizing aerial delivery of devastating energy. How well this potential force is controlled will determine 1971's award winners. ★

EGRESS SYSTEM MAINTENANCE

Ejection systems are powered by explosive devices that are rather stupid. When they are signalled to go, they respond regardless of the circumstances. We make them that way because when all else fails, they must function.

Highly trained technicians are required in order to maintain the system in perfect operational condition. Also, for obvious reasons, they must render it completely safe while they are working on it.

Experience during the past year indicates that egress systems have functioned reliably for the aircrews, but the safety side doesn't look as good. During this 12 month period there were 66 incidents involving inadvertent firing of egress components, due to improper maintenance operations.

The list of cause factors is long and quite familiar. Poor supervision, misjudgment, failure to follow the tech order or checklist, improper rigging, failure to install the safety pins . . . the list goes on and on.



to this problem is the supervisor. He must insure that his people, especially those newly assigned, are thoroughly trained on the specific type aircraft to which they are assigned. The new man may have been highly proficient on another aircraft at his last duty station, but he must be properly retrained and evaluated before being assigned to duty on a different type aircraft.

The supervisor must insist that the tech data and checklist are used at all times, regardless of how routine the job may seem.

Here is an example of what can happen when tech data is not properly used. A seat was being removed from an F-4 for phase inspection. As the seat was lifted upward the seat-mounted canopy initiator fired. Cause: the egress mechanic failed to perform all of the steps on the checklist. The linkage had not been disconnected and the safety pin installed as required by tech data.

In another case, an airman accidentally fired an M-12 initiator while attempting to remove the seat. He failed to install the lap belt initiator safety pin. This airman did not possess the 422x2 AFSC, although he was assigned to the egress shop. He had been transferred from OMS and had some egress system experience, but was not fully qualified to perform egress maintenance without supervision. The supervisor used poor judgment in allowing the airman to perform maintenance alone on a system in which he had not been trained.

Would these incidents have occurred had the supervisor done his job? Probably not. The supervisor must continually stress the importance of tech data. He must follow through to insure that his personnel are performing each task in a safe manner. And, above all, he must see to it that only qualified personnel maintain the system. This does not mean that an airman in training cannot be dispatched along with a qualified mechanic. He can and should be, so he can get first-hand experience. But he should never be dispatched alone to any job until he is fully qualified and certified as an egress mechanic on that specific equipment.

The secret of preventing most egress mishaps is forethought. Before taking any action, think of what can happen if you assume a head-up and locked attitude. Egress systems are provided for rapid inflight emergency exit, but they will function just as well on the ground if triggered inadvertently. ★



MAIL CALL

HEARING LOSS

Reference your reprint of MAICO Hearing Instruments' "Ten Danger Signs of a Hearing Loss," in the August 1971 issue. The third paragraph implies that hearing problems can almost always be overcome by medical attention or a hearing aid. The above statement is true provided that the hearing loss is a conductive type loss.

A conductive loss is one in which there is some impairment in the outer or middle ear which keeps sound pressures from reaching the inner ear. Typical conductive losses include ear drum perforations and wax build-up.

The hearing loss that the Air Force is most concerned with is caused by noise; noise induced losses are termed sensorineural because the nerve elements in the inner ear are impaired. The same ten danger signs, as stated in the article, may also apply to noise induced hearing losses. It should be emphatically emphasized that permanent noise induced hearing losses cannot be restored through any known surgical procedures or mechanical devices, such as hearing aids. Fortunately, noise induced hearing losses are easily prevented. By wearing the proper hearing protective devices when working in noise hazardous areas, Air Force personnel can insure themselves against noise induced losses.

Since a noise induced hearing loss is gradual and *painless,* one may never know he has defective hearing until it is too late. Noise hazardous areas are designated by the Base Bio-environmental Engineer who is normally located in the Military Public Health Section of the Base Medical facility.

Capt Thomas S. Webb
Chief, Military Public Health/Occupational Medicine Svcs Sec.
Hill AFB, Utah

Your point is well taken, so we'll print it for all to read. Ed.

☆ U.S. GOVERNMENT PRINTING OFFICE 1971 789 122 /3

UNITED STATES AIR FORCE

WELL DONE AWARD

Presented for outstanding airmanship and professional performance during a hazardous situation and for a significant contribution to the United States Air Force Accident Prevention Program.



Captain ROGER L. CRAKE

3250 Flying Training Squadron, Tyndall AFB, FLA

On 18 May 1971, Captain Crake was the instructor pilot in the lead aircraft of a two-ship, T-38 formation mission. When the throttles were retarded to military power on the takeoff leg at 300 KIAS, the right engine stalled, rolled back to idle, and would not recover. Almost immediately the aircraft began to roll to the right requiring full left aileron trim, one-half left stick deflection, and rudder to keep the wings level. Realizing that a serious control problem was developing and that time could be critical, Captain Crake elected to make an immediate landing. As he lowered flaps on final approach, the nose pitched up, and full forward stick and trim had no effect. Captain Crake then quickly raised the flaps which decreased pitch. He determined that by manipulating the flaps, some degree of pitch control could be maintained at 200 KIAS, while sink rate was held in limits by adjusting power on the left engine. Using this technique, he was able to accomplish a successful landing without the use of an elevator.

Investigation later revealed that a serious engine malfunction caused extensive heat damage to the aft section of the aircraft, melting portions of the horizontal stabilizer so that it could not be moved by the control stick. Captain Crake demonstrated outstanding skill in maintaining control of his aircraft using only flaps and power. WELL DONE! ★

USAF HAZARD REPORT	HAZARD REPORT NO. *(Assigned by Safety Officer)*

1. **HAZARD** *(To be completed by individual reporting hazard)*

TO: *(Safety Officer)*	**FROM:** *(Optional - Name, Grade and Organization)*

ORGANIZATION	LOCATION	DATE/TIME

WEAPON SYSTEM *(Type - model, series/A.G.E./material/facilities/procedure)*

TYPE OF HAZARD

	FLIGHT		MISSILE		GROUND		NUCLEAR		EXPLOSIVES

DESCRIPTION OF HAZARD

WHAT: A procedure which replaces the old OHR and provides a way to report all types of hazards on ONE form.

WHEN: Submit anytime you feel that a hazard exists in one of the safety disciplines (flight, missile, ground, nuclear or explosives).

WHO: Anybody can submit one!

WHY: To get the hazard removed or corrected, of course.

HOW: Through your supervisor to the safety officer. If this is not feasible, send the AF Form 457 direct to the safety officer—*but send it!* Check AFR 127-6, 30 Jul 71, for more details.

DATE	REVIEWING PERSON *(Typed or printed name and grade)*	SIGNATURE	DESIGNATED OPR
			DATE FORWARDED

AF FORM JUL 71 457 PREVIOUS EDITIONS ARE OBSOLETE. REPLACES AF FORM 471, DEC 68, WHICH IS OBSOLETE.

629.130.5
FLYS

UNITED STATES AIR FORCE • DECEMBER 1971

Aerospace SAFETY







PHOTO BY TSGT RUTH HEELER, DET 2, 1365 PHOTO SQ, ENT AFB, COLORADO.

UNITED STATES AIR FORCE **DECEMBER 1971**

Aerospace SAFETY

FOR AIRCREWS, MAINTENANCE & SUPPORT TECHNICIANS

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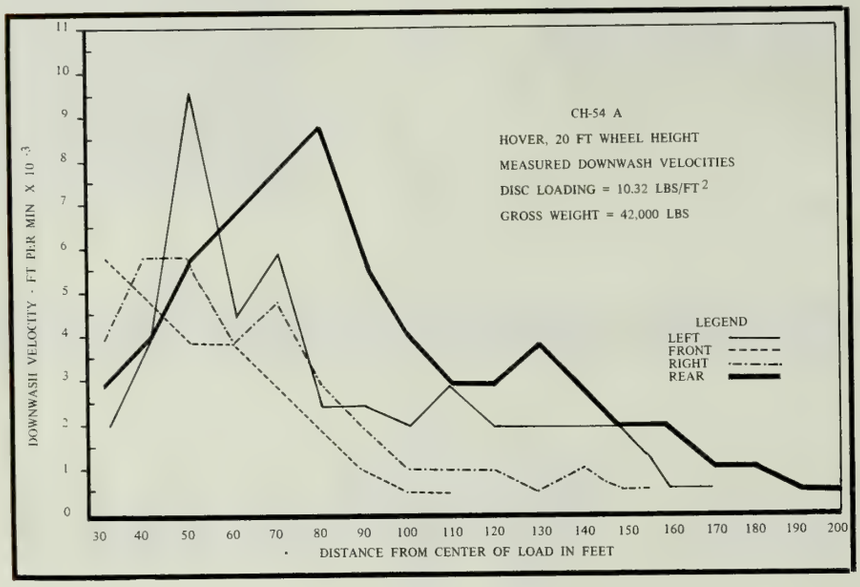
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Staff Photographer

DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

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DECEMBER 1971 AFRP 127-2 VOLUME 27 NUMBER 12


Merry Christmas
and a
Happy New Year





VERNET V. POUPITCH
Directorate of Aerospace Safety

HELICOPTER WAKE

Pilots are well aware of fixed-wing aircraft wake turbulence and the hurricane velocity of wingtip vortices generated in flight. Standards for separation have been established by FAA and more conservatively by USAF to minimize the adverse effect on control of the exposed aircraft.

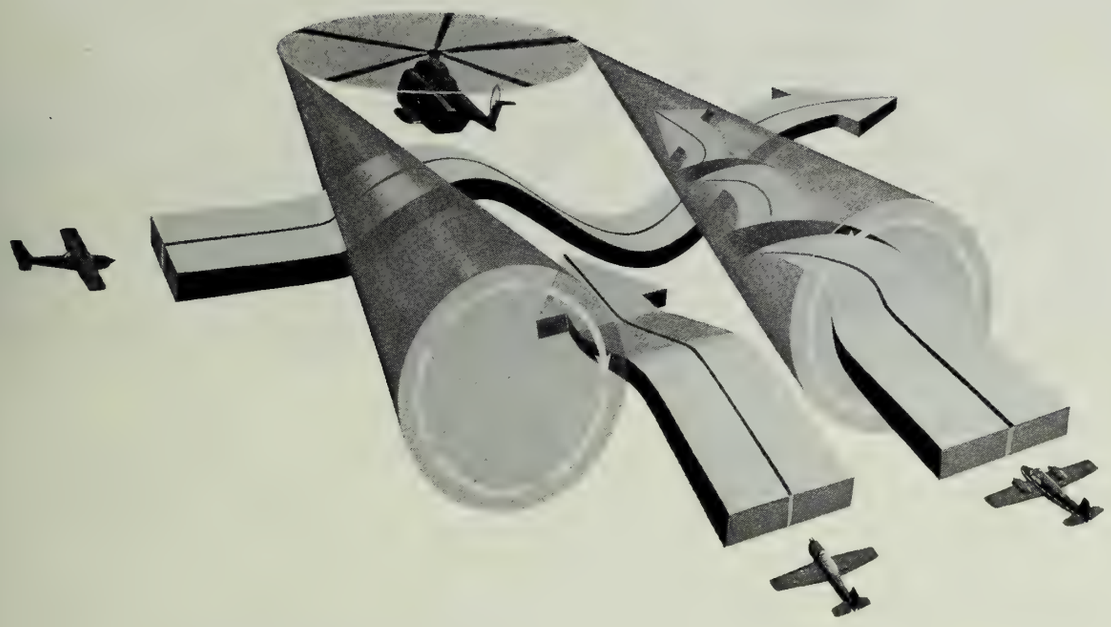
Unfortunately, light aircraft pilots and control tower operators don't appreciate the high dynamic pressures generated by heavy helicopters. A study by NASA has determined that the average velocity and the total energy of the downwash in a helicopter wake are similar to those for an airplane of the same weight and span and flying at the same speed.

Recently in SEA, a pilot was conducting transition training in an HH-53 and was cleared to make an approach to the last 2000 feet of the runway. The pilot elected to make his spot approach to a runway/taxiway intersection, which was clear at the time the approach was started. As the helicopter completed the final phase of the approach, the IP advised him an O-1 aircraft had taxied up to the intersection and their rotor wash was rocking the light plane. The helicopter pilot broke left and made a go-around and the O-1 taxied back to his ramp.

The tower operator had cleared the O-1 to taxi and unwittingly to exposure to possible damage. Had he understood the hazards and problems associated with rotor downwash from a heavy lift helicopter, he would have held the O-1 away from the approach spot.

Since all services operate light aircraft, it is imperative that all personnel involved be familiar with the extent of heavy lift helicopter rotor downwash, the energy of which is strong enough to upset small aircraft and damage larger aircraft. Based upon studies published by Dr. William P. Schane of the Aviation Medical Research Division, US Army Aeromedical Research Unit, the following is a summary of findings.

Aircraft with a disc loading of



Penetration modes: cross track, along track between vortices, along track through vortex center. Each mode presents certain hazards to penetrating aircraft.

TURBULENCE

4.35 lbs/ft², such as the UH-1 class, can generate a resultant wind as high as 3000 ft/min or 29 knots.

In larger aircraft such as the H-3, with a disc loading of 7.6 lbs/ft², a resultant wind of 5200 ft/min or 51 knots has been measured.

Similarly, disc loading for the H-53 of 10 lbs/ft² has generated a hurricane velocity greater than 10, 000 ft/min (98 knots).

Maximum wind velocities generally are recorded in a circle of radius 1 to 1.5 disc diameters from the center of impingement. (A Sikorsky Aircraft Company study of downwash velocity of the CH-54A whose disc loading was 10.32 lbs/ft² is shown graphically. Note the velocities in front, left, rear and right sides of helicopter are depicted and the left side and rear side downwash velocity was nearly 40 percent higher than at the other two sides.)

The magnitude of the resultant wind is proportional to the square of the disc loading and varies with height above the ground.

When a helicopter is within "ground effect," generally at a hover altitude of less than 100 feet or when the rotor is at 1.0 disc diameter or less above the deflecting surface, the resultant winds are horizontal and the magnitude inversely proportional to the height above the ground.

The height above the ground of maximum winds is directly proportional to the effective disc diameter and to the height above the ground of the helicopter.

These findings should make clear to all pilots and control tower operators that adequate separation must be provided between helicopters and other aircraft. FAA standards and control for fixed-wing and rotary-wing aircraft published in Terminal Air Traffic Control Handbook 7110.8B are a controller's guide for minimum safe separation. Yet, controllers and pilots are sometimes lulled from a vigilant to a complacent state, and unwittingly and needlessly permit hazardous exposure of aircraft and crews. The latest advice is to allow at least one minute separation between helicopters and approaching aircraft. ★

THE I.P.I.S. APPROACH

By the USAF Instrument Pilot Instructor School, (ATC) Randolph AFB, Texas



LOW ALTITUDE INSTRUMENT APPROACH PROCEDURES

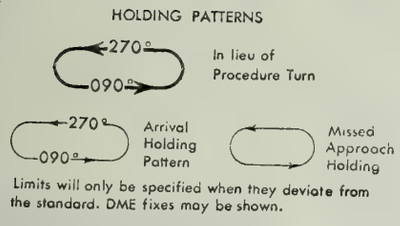
A pilot glancing through any of the FLIP Low Altitude Instrument Approach Procedure booklets is confronted with many different procedure depictions. Procedures are shown with barb symbols, holding patterns, teardrops, and procedural tracks. Three different depictions for holding patterns are in use. It is only natural that a certain amount of confusion exists as to how to fly certain approaches. A general discussion of low altitude procedures is in order and should alleviate at least some of this confusion.

PROCEDURE TURNS

In years past and until all procedure turns could be converted to the barb symbology, AFM 51-37 authorized the use of "procedure turn" procedures with any of the three depictions then in use. These depictions were the barb symbol, the teardrop, and the holding pattern. This is no longer true today. The new AFM 51-37, dated 1 November 1971, recognizes only the barb symbol as the proper depiction for a procedure turn. Use the pilot procedures contained in AFM 51-37 to fly all approaches depicted with the barb symbol.

HOLDING PATTERNS

A recent change to the Inter-Agency Air Cartographic Committee (IACC) specifications for low altitude instrument approach procedures establishes three distinct types of holding patterns. This section of the legend page is reproduced here.

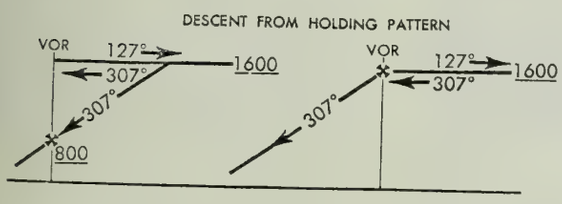


Arrival holding patterns and missed approach holding patterns are self-explanatory. Use the pilot procedures contained in FLIP Section II and AFM 51-37 to fly these holding patterns.

The third type of holding pattern is depicted with a heavy blue holding pattern symbol. Note the words, "In Lieu of Procedure Turn" adjacent to the symbol. Use holding procedures and not "procedure turn" procedures to fly all approaches depicted with the heavy blue holding pattern symbol.

All maneuvering depicted with a heavy blue line is considered an integral part of the approach procedure. This applies to the heavy blue holding pattern depiction and differentiates it from an arrival holding pattern which is not part of the approach procedure.

Descent from the minimum holding altitude is depicted in two ways—descent at the holding fix and descent on the inbound leg.



Where descent is depicted prior to the holding fix, you must be on course inbound prior to beginning that descent. In the first example above, you must be on the 307 degree course inbound prior to leaving 1600 feet for 800 feet. In the second example you must maintain a minimum of 1600 feet until past the final approach fix.

PROCEDURAL TRACKS

A procedural track is used to depict a specific route of flight from an initial approach fix to a final approach fix. Procedural tracks assume many different forms. Because the only authorized depiction for a procedure turn is the barb symbol, a "tear drop" depiction must now be considered to be a procedural track. Fly all procedural tracks exactly as they are depicted.

USAF IPIS GREETINGS

December 1971 marks the seventh year of continuous monthly "IPIS Approach" articles published in this magazine. These articles are but one service that the USAF IPIS provides to the Air Force. While these articles cannot be directive in any way, they can explain new procedures, new techniques, and answer questions of general interest concerning instrument flight. As always, the well-informed pilot will tend to be a safer pilot. We hope that the information provided in the "IPIS Approach" contributes to safety in this manner.

Most of the material in the articles is prompted by questions posed to the USAF IPIS by individuals throughout the Air Force and the other services. Please do not wait to see if your pet problem or question will one day appear "as if by magic" in these articles. Ask it! Ask it now!! Address your inquiries to USAF IPIS/DOYI, Randolph AFB, Texas 78148, or call AUTOVON 487-4884/3092.

The USAF IPIS extends best wishes to you and your family for a Merry Christmas season and a safe and prosperous new year.

Donald M. Condra

DONALD M. CONDRA, Lt Col, USAF
Commander, USAF IPIS

PILOT'S

The title of this article is wrong. It should be spatial disorientation. That's what we flight surgeons call it. Pilots seem to prefer the term vertigo. What is important is that we know this subject—what we call it is secondary.

The subject of spatial disorientation is not a new one. It is part of the pilot's academic training, it is often discussed at flying safety meetings and squadron briefings, and it frequently is the subject of articles in Air Force safety publications. It is reviewed so often because of its importance; pilots must always be reminded about spatial disorientation.

This was underscored in a study done by flight surgeons who found in a USAF major command that *spatial disorientation was the cause of four percent of all flying accidents and 14 percent of all fatal accidents.* Furthermore, 100 percent of the pilots in that command admitted experiencing spatial disorientation at least once. Therefore, it is reasonable to state that spatial disorientation commonly occurs among pilots, and that it is a factor in a significant number of aircraft accidents.

Although this subject can be quite complex, only a simplified overview is necessary for understanding. In order for human beings to be oriented in relation to the earth's surface, three special senses relay information to the central nervous system where it is integrated and interpreted by the brain. These three special senses of orientation are visual, vestibular, and proprioceptive.



THE VISUAL SENSE allows us to see. We know if we are sitting, standing, or lying by reference to other objects around us. Of the three senses necessary for orientation, vision is the most important. Even if we are denied normal vestibular-proprioceptive function (for example, due to some disease process), we can still properly orient ourselves by visual reference alone.



THE SECOND SPECIAL SENSE is vestibular. It comprises an organ (called the semicircular canals) located in the inner ear. The semicircular canals are complex, delicate tubular structures lined with nerve tissue and filled with fluid; there is one set of these canals in each ear. When the head is tilted or moved, an eddy or current of the semicircular canal fluid is created. The current, in turn, stimulates the nerve cells (microscopic hair cells) which line the interior of the canals; the hair cells then relay this information to the brain via nerve pathways. Subsequently, the brain interprets this nerve impulse and tells us in which direction the head is being

VERTIGO

Lt Col RUSSELL B. RAYMAN, USAF, MC, Directorate of Aerospace Safety

tilted or accelerated. This sequence allows one to know, even without the aid of vision, his position in relation to the earth's surface. For example, if you close your eyes and lean far to the left, you will know your position only because of the above vestibular apparatus.

THE THIRD SPECIAL SENSE is proprioception which is made up of special cells located in the muscles, tendons, and joints. These cells are stimulated by pressure and can relay, via nerve connections to the brain, information regarding the body's orientation. It is commonly referred to as "seat of the pants" information. As an example, when we go up in an airplane, the forces of acceleration act upon the buttocks. Within the buttocks, the cells of proprioception are stimulated by the upward force of the airplane. Next, a nerve impulse goes to the brain telling us that we are in a climb. With the eyes closed, we still know we are going up because of proprioception. Under normal conditions, we use visual information in conjunction with the vestibular apparatus and proprioception to know our orientation with the earth's surface.

Assuming a man has normal function of the three senses described above, he would have no difficulty knowing his orientation as long as he is *on the ground*. On the ground, the three special senses can be relied upon to give accurate information as to one's position. However, once one is taken from a ground environment to an unnatural airborne environment, the three special senses do not function as well. As a result, spatial disorientation may occur, due primarily to the brain misinterpreting the information received from the three senses (visual, vestibular, or proprioceptive). Under certain conditions (to be discussed below), such misinterpretation can happen to any pilot. When spatial disorientation occurs, the pilot will not know his position in relation to the earth. The possible consequences of this condition are obvious.



Spatial disorientation is most likely to occur when a pilot is denied outside visual reference. Therefore, he is most vulnerable flying at night, in clouds, or in poor visibility weather. Under these conditions, when vision (the most important of the three senses of orientation) is denied, the pilot has only the vestibular apparatus and proprioception to tell him where he is. But without visual reference, the latter two senses may relay information to the



PILOT'S VERTIGO

brain where it could be misinterpreted, making a pilot think he is going one way in relation to the earth when he is really going in another direction. How many pilots, while flying in clouds, with zero visibility, have felt the sensation of being in a dive, climb, or bank only to find, upon checking the instruments, that the aircraft is really flying straight and level? This is a classic example of the brain misinterpreting signals sent by the vestibular or proprioceptive senses. Once the aircraft breaks out of the clouds into VFR weather, the pilot's outside vision is restored and the three senses again accurately display their signals—the pilot then becomes oriented.

Another example of such an illusion may occur just after takeoff climbing through clouds. The pilot may suddenly experience the sensation of a steep climb when he is actually in a normal climb. In order to "correct," he pushes the stick forward; at low altitude just after takeoff, recovery may be impossible. This is called the oculogravic illusion and has been responsible for a number of aircraft fatalities.

Spatial disorientation can also occur on dark nights when the horizon cannot be discerned. Stars and ground lights appear to merge making orientation with the ground very confusing. Only instruments can tell the pilot exactly where he is.

Probably the most spectacular and most dangerous illusion is the notorious Coriolis illusion. Its effect is a sudden, severe disorientation which usually occurs when the aircraft is in a turn and the pilot rotates his head in a plane other than the turn of the aircraft. This classically occurs during a penetration turn if the pilot simultaneously rotates his head backwards to find the switch to make a radio frequency change. The vestibular organ is particularly sensitive to this maneuver and reacts violently. This phenomenon is particularly dangerous at low altitude. The pilot may suddenly become so disoriented that recovery becomes impossible.

These are only a few illustrations of spatial disorientation; many more could be cited. Pilots must be aware that spatial disorientation is always a threat and, given the right set of circumstances, can happen to anybody. The flight surgeon cannot treat this physiological illness with "pills and shots." The pilot must treat himself by looking at his instruments and believing in them. They seldom lie, but his three special senses might.

In conclusion, the following summarizes the highlights of spatial disorientation:

- Pilots of jet aircraft have an incidence of spatial disorientation five times that of pilots flying propeller aircraft.

- Pilots with little instrument experience are more susceptible than those with a lot of instrument time.

- Spatial disorientation is most likely to occur when outside visual reference is gone such as in weather, clouds, or darkness.

- The oculogravic illusion usually occurs shortly after takeoff and has been implicated in accidents.

- The Coriolis illusion is particularly dangerous and can occur during penetration turns.

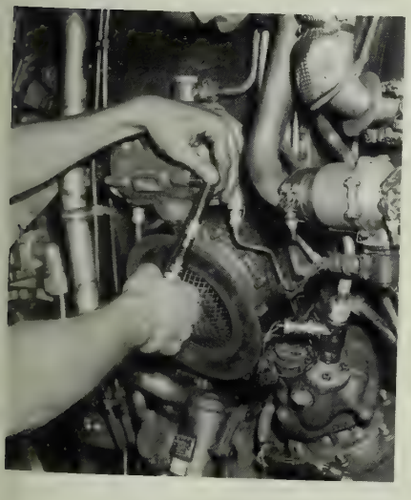
- Be aware of spatial disorientation—use your instruments. ★

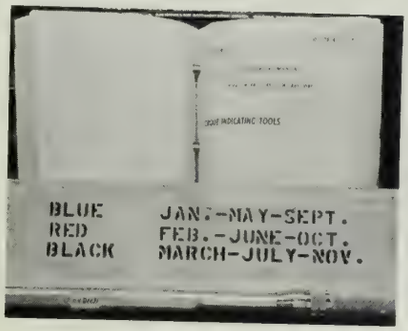
The Simple Task of Torquing Aircraft Hardware

People are killed and other lives jeopardized, many millions of dollars worth of equipment is lost, and untold manhours are futilely expended. Why? **Because a simple procedure that comes with adequate guidance is ignored.** We're talking about **torquing** aircraft hardware.

The bare statistics might indicate that very little progress has been made in this area over the years. However, a great deal has been accomplished. Standard, easy-to-use torque wrenches have been procured and distributed. Simple, easy-to-operate calibration equipment has been made available. Technical orders containing calibration and repair procedures are readily available. Our education programs continue to emphasize the importance of properly torquing aircraft nuts and bolts.

Statistics, however, clearly point to the sadder side of the picture. The truth is, many items are just not being properly torqued. For example:





C-130—Gear would not extend. Aircraft landed on foamed runway. Cause: Personnel overtorqued locknut, causing failure.

A-1E—Strong fumes in the cockpit. A rapid series of explosions during landing rollout. Fire, both crewmembers lost. Cause: Contractor failed to torque a B nut on the engine driven fuel pump.

EC-121D—Explosion occurred during engine run. Cause: Fuel system B nut not torqued during installation.

RF-4—Bump felt by both crewmen in flight, followed by number one fire light and flameout. During number one airstart attempt, number two fire light came on. Cause: Left engine fuel pump base plate not torqued.

F-106—Secondary hydraulic system pressure dropped to zero just after takeoff. Cause: System failure because of an overtorqued return line.

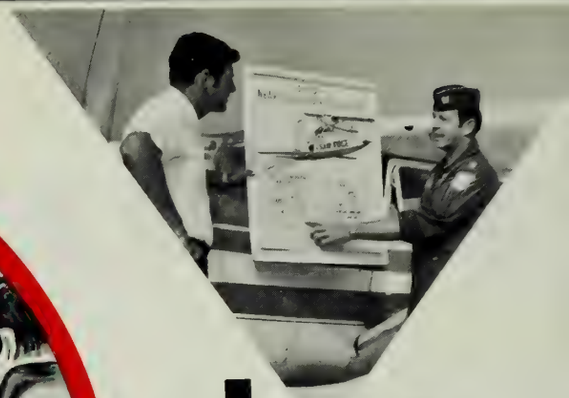
T-41—Fuel streaming from the engine cowling on takeoff roll. Mission aborted. Cause: Fuel pump supply line only finger tight.

The list is much longer. The question is, why do these things happen? One reason is that supervisors do not ensure that the proper torque equipment is available and properly used. By supervisor we mean those at all levels, from the crew chief who has an assistant to the Chief of Maintenance. The supervisor must make sure that adequate procedures are established, that each and every torque tool is calibrated on schedule and readily available when needed.

A thorough review of this critical problem area is needed. Each organization, field and depot maintenance activity would do well to review its torquing procedures to make sure that the applicable system and engine technical orders are strictly followed by all maintenance personnel. All the expensive efforts that can be pumped into this most critical area of maintenance can be diluted by the unthinking, uncooperative mechanic or supervisor who still believes that old saying, "turn 'er down tight and another half turn," will keep our high speed, close tolerance birds in the air. This type of thinking is completely unsatisfactory. The only way is the technical order way. ★







don't miss this

True professionals pride themselves on the accuracy of their efforts. Surgeons derive a great deal of satisfaction in performing a successful operation; a nurse when she is able to relieve some suffering by a patient; the architect when he designs a house that pleases the owner; the lawyer when he successfully defends a client. Pilots are no different. One of the talents that a professional can demonstrate is his proficiency in instrument work or in the traffic pattern. Since all aircraft TOs have best airspeeds and altitudes for certain maneuvers, the professional pilot strives to be precise in his flying and adheres as closely as possible to the published word.

The Stan Board pilot nodded and smiled approvingly as the examinee flew the precision pattern without losing or gaining a foot of altitude or a knot of airspeed. Both the pilot and flight examiner were pleased with the mission until the Cessna locked wings with their T-Bird. The functional check of the ejection systems in the T-33 met with success and the two military pilots survived.

The light aircraft was demolished and its pilot was killed. Cause: failure of the pilots of both aircraft to adequately clear the area.

Both aircraft were operating under the see and be seen concept, yet neither saw the other. It's a safe bet that neither of the survivors will ever find himself preoccupied with the instrument panel again, unless in instrument conditions. It's a hard way to learn but the most unfortunate part is that there are many more pilots who will have to learn this lesson . . . perhaps they will not be so lucky.

The likelihood of a midair collision is difficult to sell. After all, the sky always seems so clear and solid objects, such as other aircraft, are difficult to visualize at thirty thousand. Yes, they are there. If you don't believe our skies are crowded, pay a visit to an FAA control center sometime and get a feel for the amount of traffic they control on an average day. Even better and more impressive is the time lapse photography film that some centers have available. You can't help but be impressed.

A lot of ink has flowed over the presses recently attesting to the critical nature of the midair collision but we still have them. We've told you how to focus your eyes, how to

avoid another aircraft in close proximity, but we just can't seem to eliminate this as one of our major hazards. The example of the IP on an instrument check, so engrossed in the precision flying of his examinee that he forgot to look out, describes just one problem. But we're willing to bet that this is not an isolated case. Our position is that if you can't adequately clear the area and keep an eye on the performance of the pilot you're checking, we suggest you ignore the few knots of airspeed or a hundred feet or so of altitude in exchange for a collision-free mission.

We have presented one way in which the individual can help prevent midairs. There are other ways, some involving more people. An example is the action taken by the 3510th Flying Training Wing at Randolph AFB. There are several reasons why Randolph led ATC in reported near misses. To begin with, the San Antonio air traffic volume is greater than the combined totals of O'Hare and JFK International airports. Just considering Randolph alone, we can count 371,000 annual aircraft movements, which ties Atlanta International for the fourth busiest U.S. airport. A major factor in the near miss potential is that two "concrete airways," Interstate 35 and 10, lie directly in Randolph's traffic pattern. They are used extensively by VFR traffic.

The first cut that was taken to reduce the exposure was a program called "Heads Up" which began in 1965. This was a series of regularly scheduled briefings aimed at alerting aircraft executives including FAA officials, airport managers, and airlines representatives of the problem. Unfortunately, a survey indicated that the "word" still wasn't being passed to the light aircraft pilots. To get better coverage it was decided that television would provide one solution. The Base Information and Flying Safety officers helped a local television station in producing a three-minute news feature in which an Air Force T-41 and a T-37 jet trainer flew a simulated near miss. The film later won an award for reporting excellence.

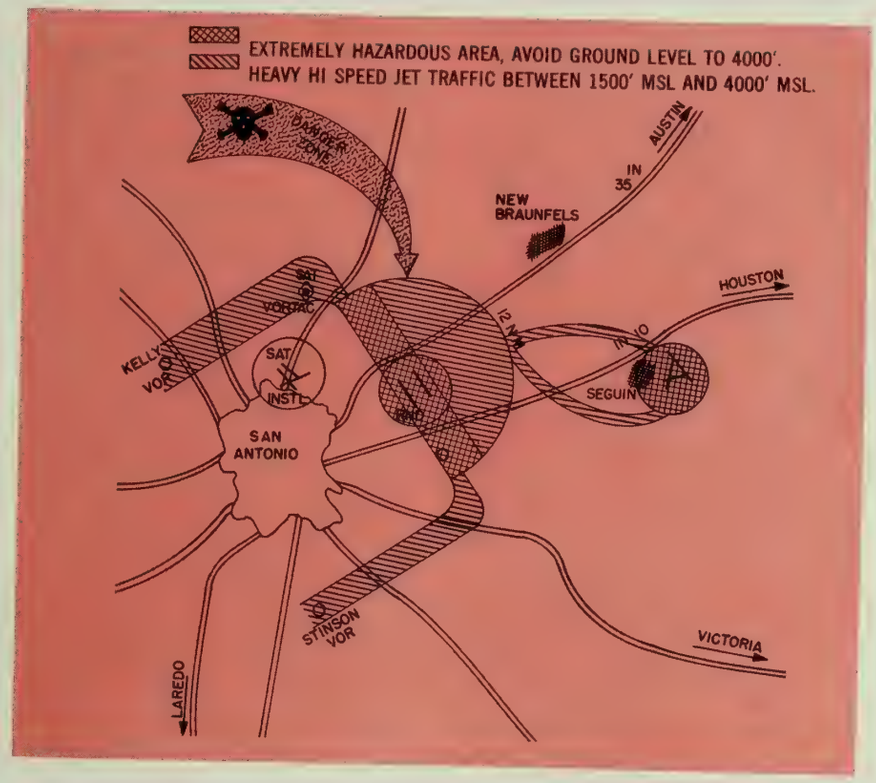
To reinforce the program the safety office began to keep track of the near misses by plotting them on a map of the area near Randolph. After pinpointing numerous close calls and analyzing them, they were able to determine the most dangerous area. From this data they constructed illustrations and charts, combining them into a detailed briefing. To insure that the leaders of the community realized the seriousness of the problem, the wing commander hosted a "Heads Up" luncheon for the Greater San Antonio Chamber of Commerce general aviation committee. During this luncheon Colonel Vandenberg, the wing commander, outlined the person-to-person effort necessary to educate all civilian pilots in the area.

To back up his premise that person-to-person contact was the major tool in education of pilots to the hazard of midair collisions, Colonel Vandenberg's safety people began making visits to small airports within a 200 mile radius. Specifically, the safety officials briefed owners and pilots of light aircraft on Randolph's "hot spots."

In addition to this, the wing commander personally wrote to more than 1500 owners and pilots of light aircraft explaining his concern over the increase in near miss incidents. He asked their assistance and pledged the cooperation of his pilots in dealing with the problem.

These are but the highlights of a program one wing was willing to pursue in an effort to reduce the growing danger of midair collisions. We do not mean to say that this is the only way to do it—just that some responsible individuals are making a real effort toward saving lives and airplanes through education. What are you doing in your organization? ★

Our thanks to TSgt M. J. McLemore, Randolph AFB, Texas, for supplying much of the information for this article.



Suddenly it's

Winter in cold climates brings its own set of problems for helicopter operators. The most serious are those associated with preparation for flight, "white-out" from blowing snow during takeoff and landing, and the effects of low temperatures on materials and people.

How the 5040th Helicopter Squadron at Elmendorf, Alaska, handled these problems with a new helo, the H-3, is related by Major Richard C. Ground, Squadron Stan/Eval officer.

The H-3, which has proven itself in tropical and sub-tropical climates, has completed its first year of sustained cold weather operations. We have used our HH-3Es on a wide variety of missions in the arctic environment during 1970-71. To our knowledge this has been the first extensive and sustained operation of the H-3 during severe cold weather conditions. Missions have been conducted in temperatures as low as −65 degrees and chill factors down to −105 degrees.

Our experience has uncovered some significant difficulties and problems that occur in flight operations and in maintenance. Some of these problems are not peculiar to the H-3 in Alaska but could be encountered in any cold weather operation. In general, a significant increase in manhours is required to complete all cold weather related tasks. Flight planning may take considerably longer, while the normally simple task of crew transportation to the aircraft is complicated by survival gear which must be carried.

In maintenance, enforced scheduled breaks have proven invaluable. A few persons may spend much of their time in heated areas, leaving a larger workload on those remaining. By the same token, a few men will try to remain on the job beyond their endurance and become a hazard to themselves and the entire operation.

Line supervisors should be on hand at all times when frostbite is a danger. During winter months in Alaska, metal freezes to a bare hand, while cuts and scrapes are sometimes not noticed until one moves to a warm area. Ramps and aircraft surfaces become skating rinks to the unwary. The same problems may be found at some northern bases in the Lower Forty-eight.

Moving an aircraft from a warm hangar into freezing temperatures has caused the entire aircraft to ice-over when the humidity was right, and struts, tires, APU accumulators and landing gear blowdown bottles to lose pressure. Tubeless tires, having lost pressure due to temperature change, come loose from the rim when supporting the aircraft on uneven terrain. Struts that deflated in −65 degree temperatures, when no servicing facilities were available, were protected from bottoming by jacking up the aircraft and wrapping rope around the lower strut. Seals were ruined in those struts that were allowed to bottom. Rotor head covers that came with the H-3 became stiff and unmanageable in low temperatures. No acceptable replacement covers are yet available.

Moisture problems in pressure systems were alleviated by reservicing the system with nitrogen. Pulling landing gear and fuel tank pins after APU start and before rotor engagement, as is now authorized in the latest H-3 Flight Handbook, has allowed a much safer operation for ground handling personnel.

Aircraft commanders have the responsibility of insuring that all crewmembers and passengers have sufficient cold weather gear to survive if the need arises. Sometimes this is a pretty big order: Several newsmen who were taken onto the Ice Cap to observe a joint Army/Air Force landing picked up more severe frostbite in the few hours than all of the military personnel involved in the maneuver. This was not an Air Force helicopter involved and the crew had little choice in the matter of passenger clothing being worn.

Leather boots provide little protection from the cold; however, if that's all you have in a walking situation, plastic bags slipped over the sock inside the boot will help keep the foot dry and warm. Insulation from the aircraft works well on humans if the need arises, but

... WINTER

HELICOPTER IN THE COLD

improvisation seldom beats proper equipment.

Flight crews should fly the routes filed unless assured that any deviations are recorded by flight service. Many an hour has been spent searching for a pilot who changed his route without informing anyone. Winter IFR flights are more difficult over mountains with high MEAs. The "D" factor in Alaska was as great as −3000 feet at times during the past winter. With a 10,000 foot MEA this puts you down among the mountains at MEA or above the oxygen required altitude if the "D" factor is corrected for in filing IFR.

Icing conditions have limited instrument helicopter flights, resulting in much lower airspeeds and descent due to insufficient power to maintain level flight with the load of ice and disrupted airfoils. Ice has formed on helicopter blades during taxi in a light fog. This winter we are using blade anti-icing tape which may make a difference.

Another major winter hazard has proven to be whiteouts from the snow cloud created by rotor wash during takeoffs and landings. If the mission is such that a landing in loose or unbroken snow is required, a few precautions will reduce, but not eliminate, the hazard. The best way to land in loose snow is to touch down ahead of the snow cloud caused by the rotor wash. This is only safe when the depth of the snow and terrain underneath is known.

If a landing from a hover will be required, figure that blowing snow will obliterate all but the most contrasting colored objects close at hand. This unit produced bright colored stringers about six feet long with a small weight at one end. These stringers are rolled up and carried aboard the aircraft to be dropped when natural references are not available, on a frozen lake for example. If small bushes are visible, they make excellent hover references provided the approach terminates with the bushes as close to the pilot as safely possible. If the landing area is near open water, an approach to the water's edge will provide a hover reference for touchdown. If power is sufficient, a hover above the snowcloud may be established in an attempt to move the loose snow and uncover a hover reference.

Smoke bombs are good if the snow is not too deep. Beware of loose objects used as references that may blow away in the rotor wash when you need them. We have learned not to make a low turnout over a frozen lake from a wooded shore line. If weather will not allow a climb, ease out from the shore until a safe turn may be made back in the direction of the shore. A tight turn with a good reference is much safer than a gradual turn with marginal visual references.

Finally, when you arrive back at the barn and are ready to escape to the warm ops building, don't forget to complete the 781 correctly with all the discrepancies, allowing maintenance control to plan necessary work on the aircraft and, thereby, assuring yourself of a safe aircraft next flight. And don't slip getting out of the bird! ★



HAIRY TALES

this class is a drag, when d

Any doubts about these long, boring academic hours that teach you things you "don't need to know"?

Flight level 180, 300 KIAS, solo lead, formation. Cold flashes, dull reactions—I think I should select 100 percent oxygen. My wing aircraft is out in trail somewhere about a mile behind me. I'd better rejoin them and tell them I am having problems.

It was a beautiful afternoon to go flying. My instructor and one of my friends would fly wing while I was to fly solo lead in the T-38 formation ride. After our pre-departure briefing, we set out for the two aircraft we would fly on this mission. There was a small mix-up as to who was to fly which aircraft, but we finally decided which one each of us would take. We then proceeded with a thorough preflight, and all systems indicated another routine student formation ride.

Taxi into position and hold, cleared for takeoff. Gear up, flaps up, after-takeoff checkist. Our flight was cleared on the assigned departure to an altitude block of FL 250-FL 310 for some high altitude maneuvers. While climbing through 12,000 feet, the cabin pressurization started to fluctuate causing my ears to pop. This continued as we passed through 17,000 feet. I informed my IP in the Nr 2 aircraft of the problem and I suggested we remain in a low altitude block from 10,000 feet to 22,000 feet for some other airwork. I felt that this would not affect my flying, as in the T-37 we flew unpressurized and I never experienced any problems, and also the mission would not be a total loss from a training standpoint.

Our flight requested and received a low altitude block to practice close and extended trail. I did not feel the pressurization fluctuating as much as before, and it didn't seem to bother me. After about five minutes of extended trail, I started to feel cold flashes and my judgment was starting to become impaired. I was performing maneuvers which were not normal.

I started to think back to the training we were given several months ago, remembering about hypoxia and how it can be such a silent and unsuspecting killer. I re-

REX RILEY'S
CROSS COUNTRY NOTES



TAQ: On recent inspections Rex has been paying particular attention to the Transient Airman Quarters. Nothing is more frustrating to a crew chief, load chief, or flight engineer than to have to sleep in a noisy, hot, crowded room after spending several hours with his bird, making sure everything is ready for the next day's launch. Or equally bad, to finish your task at 2300 hours, hungry and tired, and find that the snack bar as well as the NCO club stopped serving hours ago. Rex thinks we owe it to our fine traveling airmen to see that the treatment they get is as good as possible. How well they perform cannot help but be a factor in the success of the mission.

ATTITUDE AGAIN: We are beginning to wonder if the remarks section of the flight plan gets attention from anyone. Several recent incidents have led us to believe that if someone is reading the request by the pilot, they are neglecting to pass the information on to the troops who must get the job done. For example, a C-118 aircraft commander requested steps for his passengers to deboard the aircraft. Despite the fact that the base had the time of arrival of the bird, the steps never came and the crew ladder was used to deplane.

MAIL CALL: Our response from the overseas traveling air force has been quite good. We were happy to forward kudos to USAFE after a DO sent a favorable letter to us about one of the European bases. We hope you will keep us up to date and tell us what you think about the service you get. The more mail we get, the better picture we can formulate about how we are progressing.

SNACK BAR: We have heard a few of our troops grumbling about the automatic snack bars found at many of our bases. I really don't think this is too bad, if an electronic oven is available to warm up the chow. At least it beats going to bed hungry. Budget limitations being what they are, this seems to be one solution. Anyone have a better one?

QUICK RESPONSE: If you just can't spare the time to drop us a note concerning the service you have received at various bases, pick up the phone and dial AUTOVON 876-2633 and ask for Rex. We'll have a steno on the extension to take down your comments.

Merry Christmas and Happy New Year.

Rex



REX RILEY
Transient Services Award

LORING AFB	Limestone, Me.
McCLELLAN AFB	Sacramento, Calif.
MAXWELL AFB	Montgomery, Ala.
HAMILTON AFB	Ignacio, Calif.
SCOTT AFB	Belleville, Ill.
RAMEY AFB	Puerto Rico
McCHORD AFB	Tacoma, Wash.
MYRTLE BEACH AFB	Myrtle Beach, S.C.
EGLIN AFB	Valparaiso, Fla.
FORBES AFB	Topeka, Kans.
MATHER AFB	Sacramento, Calif.
LAJES FIELD	Azores
SHEPPARD AFB	Wichita Falls, Tex.
MARCH AFB	Riverside, Calif.
GRISSOM AFB	Peru, Ind.
CANNON AFB	Clovis, N.M.
LUKE AFB	Phoenix, Ariz.
RANDOLPH AFB	San Antonio, Tex.
ROBINS AFB	Warner Robins, Ga.
TINKER AFB	Oklahoma City, Okla.
HILL AFB	Ogden, Utah
YOKOTA AB	Japan
SEYMOUR JOHNSON AFB	Goldsboro, N.C.
ENGLAND AFB	Alexandria, La.
MISAWA AB	Japan
KADENA AB	Okinawa
ELMENDORF AFB	Alaska
PETERSON FIELD	Colorado Springs, Colo.
RAMSTEIN AB	Germany
SHAW AFB	Sumter, S.C.
LITTLE ROCK AFB	Jacksonville, Ark.
TORREJON AB	Spain
TYNDALL AFB	Panama City, Fla.
OFFUTT AFB	Omaha, Nebr.
ITAZUKE AB	Japan
McCONNELL AFB	Wichita, Kans.
NORTON AFB	San Bernardino, Calif.
BARKSDALE AFB	Shreveport, La.
KIRTLAND AFB	Albuquerque, N.M.
BUCKLEY ANG BASE	Aurora, Colo.
RICHARDS-GEBAUR AFB	Grandview, Mo.

THE CREW CHIEF

Capt WILLIAM V. WOODWARD, HQ 7th Air Force
APO San Francisco 96307

The F-4 Phantom is on its final approach, a hot white pinpoint of light on the horizon—a puff of smoke as the tires hit the runway. A turn down the taxiway, and it's back home again in its heat-scarred revetment.

Sgt James W. (Bull) Cunningham watches the plane land. Parking his bike, he then walks down the ramp to his own Phantom—number 303. At six in the evening another 12-hour work-day is about to begin. In the morning the bird will be airborne. But now it sits there silently, waiting for him.

Sgt Cunningham is a crew chief. He is 21 years old, six feet one inch tall, and well aware of the responsibility he has for the aircrews who fly his aircraft. Facing him is a complex machine of steel, aluminum, and wire—an aircraft as complicated as a Bluegrass filly and twice as temperamental.

He takes up a two-inch-thick checklist. "Bull" runs through those items that mean potential trouble on the ground but life or death in the air. He then checks the pins inserted in the F-4 ejection seats, canopies, downlocks, and finally the pylons.

The work begins . . . a hundred little things on paper. Screws fussed over, rivets pecked, dials tapped, connections checked and rechecked. Shoeless and armed with a flashlight, he injects himself up into the narrow cave of aluminum, the intake. On the way he stops to check a pencil-sized tube that measures air pressure to the engine.

He crawls farther, looking for foreign objects that could damage



. . . NOTHING MISSED.



NON-STOP . . . WORKING THROUGH THE NIGHT.

gets it all together...



CHECKLIST—CREW CHIEF'S BEST FRIEND.

an engine. Then he checks for foreign-object damage on each of the delicate blades of the compressor. Clean. He backs out slowly, emerging into the night feet first.

He picks up the checklist and continues. So far, everything is okay. And then he sees the cut on the tire. It is a narrow cut, barely perceptible, on the side. Unchanged, it could mean a blowout as the aircraft races down the runway at 175 knots. Out come the hydraulic jacks. As the aircraft is raised, a sweat builds in the sticky heat of the night.

It's 2 a.m., time to switch fuel tanks from the center line to the wings for a different mission. "Bull" and a helper wait while the munitions men dearm the pylons, removing the explosive charges that enable the tanks to be jettisoned in flight.

The tank is lowered carefully on to a dolly, then wheeled away. In its place, from the "tank farm," come a set of wing tanks. These are mated separately beneath the wing of the F-4. Then the "fun" begins, as each is jockeyed on its dolly to match the tank pylons and wing attachment points . . . the locking mechanism is actuated and locked.

Now it's 0440, time to catch a breather, time for a duck beneath the wing with a cup of coffee and a letter from his wife. Down the line the beams from a half-dozen flashlights are cutting the night as other crews labor to ready their birds for the morning mission.

At 0500, a crew truck pulls up and the pilot and navigator climb out. Sgt Cunningham gets up to meet them and gets poked in the ribs and kidded about putting on weight.

The crew chief and the crew go over the preflight checklist and the aircrew perform their walk-around inspection. The two-man F-4 crew climbs up the ladder and into the cockpit. Sgt Cunningham buckles them in. The small air turbine used as a starter brings number two engine whining to life. The engine instruments are checked within limits. Nr 1 comes to life and, again, all engine instruments are checked. The pilot swings the flight controls through their arcs—all okay.

"Bull" gives them the thumbs up signal, and 303 rolls down the taxiway, turns toward the runway, and waits for takeoff clearance. Thunder assaults the ground and the air ripples in a long, broken wave of heat. The F-4 moves down the strip, climbs away from the rising sun, and fades to a burning dot on the horizon.

A tired crew chief watches the dot, arches his back in a stretch, and then heads for the crew shack.

There are thousands of "Bull" Cunninghams—crew chiefs on all kinds of aircraft. Most are not quite six feet one inch tall, but they all have one thing in common. From liftoff to landing, each one of them is the most important man in an aircrew's life. ★

tech TOPICS

BRIEFS FOR MAINTENANCE TECHS

• failure to fill forms

During preflight of a T-29 the crew chief found the main hydraulic accumulator pressure low. A servicing cart was requested and delivered, and the crew chief proceeded with the servicing operation.

The crew chief finished servicing the accumulator and then was called away to perform maintenance on another aircraft. He returned a few minutes later, completed the preflight, and requested an engine specialist to ops check Nr 2 engine. The crew chief went off duty before the engine crew arrived at the aircraft.

The two engine specialists arrived and performed the pre-engine start inspection. A fire guard was posted and a normal start accomplished. Shortly thereafter, the engine stabilized at 1000 rpm. At this time the accumulator servicing fairing fell from the aircraft and was picked up by number two propeller. The fairing was thrown into number one engine cowling cutting a four-inch gash. The fairing was damaged beyond repair.

The cause of this mishap was failure of the crew chief to properly reinstall the fairing. Granted the crew chief was called off the job just as he was starting to install the fairing but had a form entry been accomplished, even though the crew chief had gone off duty, the engine specialist would have known the status of the aircraft prior to engine start.

• torque

After leveloff at 15,000 feet, the loadmaster of a C-130 noted oil leaking from the Nr 3 engine nacelle. All engine instruments were normal and there was no noticeable decrease in oil quantity.

The cause was maintenance. The reduction gear box magnetic drain plug had been improperly torqued during maintenance. The plug was loose even though the safety wire was in place.

An A-37B pilot shut down Nr 1 engine in flight because the fire warning light illuminated. Cause: improper torquing of the tail pipe clamp during installation.

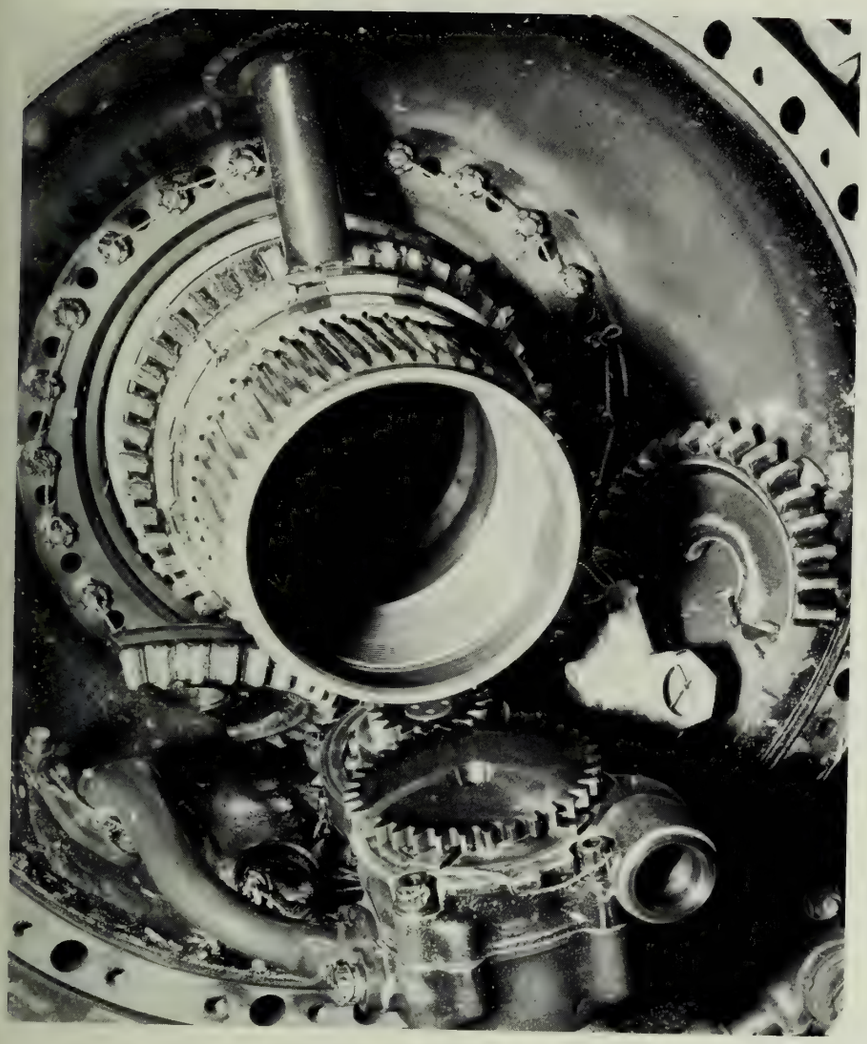
Who is not properly torquing the nuts and bolts? The answer is people at various levels of maintenance from the depot to the line mechanic. Supervisors at all levels must insure that proper torque tools are readily available and properly used.

• that smarts!

The injury of a sergeant whose foot was crushed between the cargo ramp and fuselage of a C-123 underscores the need for strict attention to the job being performed.

The injured man, a passenger, was headed for a seat when he walked onto the ramp. At that moment the loadmaster started to close the cargo ramp and it caught the man's foot.

Most injuries follow this pattern. A moment's inattention and the damage is done.



• two wrongs make an accident

The F-102 pilot was closing on the target when the radar scope went blank and the aircraft yawed to the left. A quick glance at engine instruments confirmed engine flameout. After all attempts failed to restart the engine, the pilot flew to the closest airport; however, the field was obscured by clouds so the pilot elected to eject, which was successful.

The primary cause of the accident was maintenance. Improper stacking of the accessory drive (bull) gear with insufficient clearance (backlash) between the accessory drive gear and the mating bevel gear shaft caused an overload condition leading to progressive wear, metal fatigue, and subsequent failure, as pictured above.

Contributing cause was supervisory factor. Personnel associated with the spectrometric oil analysis program failed to detect a consistent pattern of abnormal build-up of iron wear contamination in the oil samples taken over a period of several months prior to this accident.

• cotter pin –lack of

During a GCA the number three throttle of the KC-135 disconnected, leaving the pilot with no control over the engine. The engine was shut down using the fire switch and an uneventful three-engine landing accomplished.

Maintenance found that the bolt, nut, and cotter key were missing from the throttle linkage where it attaches to the fuel control. A review of the records showed that maintenance had been performed in that area seven days prior to the incident.

It is believed that the cotter key was not installed at that time and that the nut vibrated loose in flight, allowing the linkage to disconnect.

• cooperation??

The T-37 had an overheat light illuminate on initial takeoff at 150 knots, 300 feet AGL. The throttle was retarded but the light remained on and the engine was shut down.

Inspection revealed the charred remains of 1T-37B-6WC-1 (Preflight/Basic Postflight Inspection Workcards) in the engine compartment.

This bird had just returned from cross-country, and it is believed that the workcards were left in the engine compartment by transient alert. Regardless of the source of the error, no pilot should be subjected to such careless actions on the part of maintenance personnel.

tech TOPICS

• T-38 flameouts

T-38 engine flameouts continue to be a front-runner among the incident reports received, and improper rigging is a prime contributor. Here are three examples:

• During an instrument check ride, at 10,000 feet and 300 knots, the left engine began running rough in the 70- to 80-percent range. The engine flamed out when the throttle was retarded to idle.

Cause: Maintenance factor. Minimum rigging of the bleed valves, combined with rust lick buildup, caused the bleed valves to schedule out of the lower limits.

• Another T-38 was at 45,000 feet. When the throttles were advanced from military to A/B range, the right engine popped twice, fluctuated, and flamed out.

Cause: A-8 cable out of rig. No maintenance had been performed on this engine since PE.

• The third aircraft was at 43,000 feet. As the throttles were advanced for an altitude change, the right engine flamed out.

Cause: Improper rigging of the A-8 cable.

In all three cases, maintenance was at fault. Strict compliance with available tech data, coupled with a sound quality assurance program, will eliminate these J85 engine rigging problems.

• attention C-130 flight control instrument technicians

This item came to us from SSgt Giles R. Honse, NCOIC of the Flight Control Section, 7406 Support Squadron (6MAV), APO New York 09057.

"Have you noticed your Standby Compass out of tolerance more than usual? The 7406th Support Squadron Auto Pilot Shop has discovered an error of up to ten degrees in the Pilot's Standby Compass (B-21).

"While following the 1C-130A-2-6 Compass Swing Procedures, the 7406th Auto Pilot Shop ground swung and operationally checked the Standby Compass 'A-OK.' However, after an inflight air check, the compass had an error of ten degrees.

"After an extensive search, I found that the Pilot's Repeater Indicator (Type V-7A), was magnetized. I also discovered that by manually turning the Pilot's V-7A Compass Card, the standby compass would deflect ten degrees off the original heading. Replacing the V-7A indicator corrected this problem. A fleet-wide check revealed one more instance of this.

"To answer the question, 'Why did the Standby Compass ground check OK, but not air check?', the Heading Reference is read directly off the N-1 Compass Master Indicator during ground swing procedures. The Pilot's V-7A indicator is not used. This means that the error caused by the magnetized V-7A indicator remains constant and is compensated for during the ground swing. However, during inflight operation, the pilot manually adjusts the V-7A indicator's compass card to read the aircraft heading and in so doing, causes the unwanted error in the Standby Compass.

"It would pay to check your aircraft by simply rotating the V-7A indicator card slowly through 360 degrees while watching the Standby Compass for any deviation."

• torque trouble

After level-off at 2500 feet, while the O2-B pilot was establishing cruise power settings, he noticed a discrepancy between front and rear engine fuel flow. The front engine indicated 12 gph, the rear engine the normal 14 gph.

Several minutes later the front engine fuel flow started fluctuating between 10 and 12 gph. The front auxiliary boost pump was turned on and the fluctuation stopped, with fuel flow at 14 gph. Shortly thereafter the pilot noted fuel fumes in the cockpit. An emergency was declared, 200 pounds of cargo was jettisoned, the front engine was shut down and the bird returned to base without further difficulty.

The fuel supply line to the front engine fuel pump was found loose. The fuel pump had been changed the night before by the crew chief, who failed to properly torque the supply line during installation.

• Aero-7A missile launcher maintenance

A recent mishap report revealed that the hazard associated with Sparrow (AIM-7) missiles hitting launch aircraft continues to be a problem. Inadequate Aero-7A missile launcher maintenance within F-4 units has been the cause indicated for these mishaps.

Disassembly inspection of the Aero-7A launcher involved in the above incident revealed the malfunction was caused by **rust** and **residue** from fired cartridges. Performance of scheduled maintenance requirements could have prevented the mishap.

Aero-7A launcher maintenance must be performed at the scheduled intervals prescribed in TO 1F-4C-6 and applicable maintenance work cards. Commanders, supervisors, and safety personnel should make Aero-7A maintenance an item for continuous emphasis.

(TIG Brief 17, 1971)

• improper routing

CASE 1:

Both pilots of the C-47 smelled smoke in the cockpit just after takeoff. The flight mechanic reported heavy smoke and possible fire coming from Nr 2 engine. Fire emergency procedures were applied, the engine shut down, and the aircraft returned to base.

The nose scavenge oil line had chafed against the left magneto blast tube to the point of failure. Oil leaked onto the exhaust collector ring causing the fire and heavy smoke.

CASE 2:

A QU-22B was airborne 45 minutes when the oil pressure began to fluctuate and drop. The pilot headed back to base. Upon arrival over the base the pressure was down to 15 psi.

After the aircraft landed it was discovered that the line connecting the oil screen to the filter had come in contact with the flywheel. An elbow fitting was turned at such an angle that it misrouted the line.

In both these incidents maintenance failed to properly route the oil lines. Two more chapters in the continuing story on "failure to follow tech data."

• follow the TO

Apparently some F-105D units are not following TO 1F-105D-2-6 and 4S-1-63-25 during maintenance on landing gear struts. Proper torquing of the upper and lower torque arm scissors assemblies appears to be one phase of the assembly where maintenance is not sticking to the TO. One major accident occurred this year when the strut failed. During the investigation the torque arm scissors pivot bolt and nut were discovered stripped. This nut could have possibly been overtorqued during assembly, although failure of this bolt and nut was not the primary cause of the accident. A one-time inspection turned up several other assemblies with too little or too much clearance, clearly indicating under- or overtorque.

TO 1F-105D-2-6 which covers removal and installation of the entire strut assembly does not list any torque value for the pivot bolt and nut. Normal torque for this size and type bolt as listed in the aircraft hardware TO is 450 to 500 inch pounds. The required torque when this bolt is installed in the torque arm scissors is 150 inch pounds in accordance with 4S1-63-23, the component tech order. So let this be a warning; when installing the strut you must consult TO 4S-1-63-23 for the proper torque for the pivot bolt.

• C-130 generator problem

All four engines of the C-130 were being run following IRAN. The Nr 4 generator did not come on the line and would not reset from the cockpit. The electrician reset the Nr 4 generator control panel, and the generator was then reset from the cockpit. The generator voltage came up, then failed, followed by heavy smoke from the cargo bay.

The mod team had goofed this one. The Nr 4 generator wires on terminal board 169 were improperly connected, causing a dead short between B and C phase.

Review of the records indicated that no maintenance had been performed in this area. However, new nuts were found on all terminals in the equipment rack. It was suspected that the new nuts were installed during the corrosion control portion of the IRAN, and that the wires were crossed at that time. ★

Ops topics

HEADS UP!

The refueling mission was going along nicely as scheduled. The block altitude assigned was FL 280-300, and both aircraft were at FL 290, heading southwest.

In the middle of the mission a commercial DC-9 passed from right to left, heading roughly northeast. At the nearest point, the airliner was within about 800 feet ahead of and 100 feet below the tanker.

Center was queried and confirmed the block altitude assigned. Furthermore, Center had no knowledge of an airliner in the area! A little research while filing a report to FAA disclosed that this was the second near-miss in that area in the past thirty days.

Need we say more? Heads up!

CAUSE AND EFFECT

The primary reason for defining cause factors is *not* so that someone can be blamed. AFR 127-4 is quite clear on that point. The purpose of identification of cause factors is to help us prevent an incident from becoming an accident or an accident from recurring.

A recent C-7 incident raised our eyebrows. The aircraft departed home station on a trash run. Shortly after level-off, the low oil quantity light flickered, and oil temperature was checked at 60 degrees. A few minutes later the light came on steady, and the pilot decided he'd better turn back for home. The crew monitored the oil temp closely and, when it went through 72 degrees, shut down the engine and landed at an outlying airfield.

Inspection showed the Nr 1 engine was 10 gallons low on oil. Duration of flight was .7 hours.

The aircraft was serviced, run, and reinspected with no discrepancy found. Oil consumption on the next flight was .8 gallons per hour.

The incident report listed the primary cause as undetermined, but most probably operator factor in that the copilot did not check the oil. We can't argue too much with that; it's likely that he didn't check the oil. But who checked the 781? And who serviced the aircraft? And who signed it off as being serviced? The message doesn't say.

CONVINCED?

The mission was airdrop, and the C-130 loadmaster was serving as the kicker. He was attempting to retrieve static lines when he slipped and fell from the aircraft! The loadmaster suffered only a broken arm. Why? *Because he was wearing his restraining harness,* and other personnel were able to pull him back into the plane. How's that for a convincing argument?

THE POWER OF SUGGESTION

A recent NTSB incident report points out an error which can happen when diligence on the part of flight crewmembers is not maintained. The following excerpts are taken from the preliminary report:

". . . . flight was assigned a cruising altitude FL 230 which was shortly changed to FL 290 for the flight leg to destination. In the vicinity of an enroute VOR, the flight was cleared to descend to FL 240. Crew reported reaching FL 240 and was then cleared to 11,000 feet and given altimeter setting of 29.99. The First Officer, during descent, reported leaving Flight Levels 290, 240, 230, and 17,000 feet to ATC. He further stated he advised the Captain of leaving 'one two thousand for one one thousand.' As First Officer was about to report level at 11,000 feet, he looked outside the aircraft and saw tree tops just below their flight level. Reported weather at the time was indefinite 400' obscured quarter-mile visibility in light drizzle and fog. G forces exerted during pullout forced a stewardess to her knees in the aisle. Aircraft climbed to and reported level at 11,000 feet to ATC. Flight then proceeded to destination and landed without further incident.

"The Captain in his statement of the incident stated, 'The altimeters in the plane are the old type. We all misread the altimeters some place in the descent and did not catch it until we had descended to what we thought was 11,000 feet.'

"Preliminary readout of the flight recorder revealed that the highest altitude flown during this flight leg was 19,000 feet.

"The altimeters installed were the 3-pointer type."

It appears that the power of suggestion was at work in this incident since all three flight deck crewmembers misread the altimeters by 10,000 feet.

The point we are trying to make is, individual diligence is a *must.* Do not be misled by the actions of a fellow crewmember. Always do your own check and double checking!

Take nothing for granted while flying an aircraft.

(Flight Safety Foundation Bulletin)



HORIZONTAL TORNADO

On downwind, the O-2 pilot saw a C-130 making a straight-in approach to the same runway. He continued his normal pattern, dropped full flaps, and was cleared to land, number two. The tower gave the pilot the winds and cautioned him of possible wake turbulence behind the C-130; the pilot acknowledged.

About 1000 feet from the threshold and 50 feet in the air the O-2 hit the wake turbulence. The pilot added full power and did everything he could to get out of it, but didn't succeed. His left wingtip hit the ground about 15 feet right of the overrun and 350 feet short of the runway.

Much material has been published about wake turbulence, most of it containing the statement that the strength of the vortex may exceed the control capability of the aircraft caught in it. What does this mean? Simply this: If the turbulence is descending faster than your airplane can climb—you're going to descend, *no matter what you do!* If the turbulence rolls right faster than your airplane can roll left—you're going to roll right, *no matter what you do!*

What should the pilot have done? There's only *one* thing a pilot can do about wake turbulence: AVOID IT! The guy in the example above *saw* the C-130. He *knew* where the vortex was likely to be. And he hit it anyway. In fact, assuming the C-130 was following the VASI to a 50-foot threshold, and considering where the O-2 was when it hit the turbulence, the pilot had placed himself on a flight path along which he *had* to contact the vortex.

Let's consider two very important facts about wake turbulence: The first is that the vortex settles—it can always be found *below* the flight path of the generating aircraft. The second fact is that, while we know the vortex will dissipate, we don't know how long it takes! It may be as much as five minutes—and maybe even more than that!

Keeping these two facts in mind, let's consider what the pilot in our example might have done:

- He might have gone somewhere else. This is not usually practical.
- He might have extended his downwind and final sufficiently—say, two and a half minutes each—to let him land five minutes behind the C-130, or he might have done some 360s on downwind—say, two or three standard-rate turns. Unfortunately, at some bases this would allow several other aircraft—some of them tornado-generators—to come between him and the object of his concern. Usually, all he's done is substitute another problem for the one he had.
- He might have flown a short approach, used a moderate glide angle, stayed above the C-130's flight path (and the vortex), and landed a little long—past the touchdown point of the C-130. This last one makes a lot of sense to us. The pilot in this instance was looking at a couple of miles of asphalt in front of him, and he certainly didn't need all of it.

The main point we're making is: be aware that wake turbulence is a possibility—that it is often more than a light aircraft can cope with—and the smart pilot will use his judgment to avoid it.

FLIP CHANGES

FLIP High Altitude Chart Information Changes: Beginning with the November 11, 1971 edition of FLIP enroute high altitude-U.S. charts:

a. The elevation, length of longest runway, ATIS frequency and the symbol indicating the availability of PFSV will be removed from the chart. Aerodromes will be shown only with the appropriate airport symbol and name.

b. Only those aerodromes with runways 5000 feet or longer and with an approved published instrument approach procedure will be shown.

c. ARTCC remote controlled air to ground sites will be removed from the chart and ARTCC frequencies on the front panel will be deleted.

d. The unusuable route symbol will be reduced in size.

WE TOLD YOU SO

The RF-4E was taxiing back to the parking area behind a C-5 headed for the fuel pit. The C-5 made a right one-eighty to position itself for the fuel pit and the RF-4E taxied on by. When the fighter reached a point approximately 100-150 yards beyond the big transport, it was suddenly engulfed in a cloud of dust and sand—as the C-5 advanced power to pull on into the fuel pit. The F-4 pilots brought the throttles to idle and closed their canopies and, when the dust settled, taxied on in to the ramp where a FOD inspection was conducted.

Yes, indeed! Forty manhours to blend out the first stage pit marks; replacement of the pitted right-hand camera door optical glass; and extensive polishing of the right windscreen.

The message ought to be loud and clear:

• Avoid taxiing behind the big boys whenever possible.

• If you must taxi behind him, *establish radio contact and coordinate your passage through the danger zone.*

DISTRACTION - BANG!

The F-106 pilot experienced a minor steering difficulty during the landing roll and spent some time trying to determine the problem after he cleared the runway. As a result of this distraction, he missed step 3 in the After-Landing checklist: he didn't disconnect and safety his parachute.

After he taxied in and shut down the bird, the pilot disconnected his seat belt and parachute harness, but failed to check the parachute firing lanyard (step 2, Before Leaving Aircraft checklist). As he got up to deplane, he felt a slight tug, realized that he had forgotten to release the parachute and immediately sat down to pull the ditching control handle.

Too late! The parachute deployment gun had been initiated and, after the appropriate time had elapsed (two seconds), the gun functioned as designed. The slug from the gun departed the aircraft between the right rail and the canopy.

It was only an incident, and we were lucky. But the whole thing could have been prevented by following the checklist. ★

THE HIGH COST OF HINDSIGHT

Maj RICHARD C. KIRK, Directorate of Aerospace Safety

In missile launch operations, as in most efforts, hindsight is no substitute for thorough mission planning. This fact was brought out recently in a mishap resulting in the loss of a multi-million dollar space vehicle.

The launch countdown had proceeded with minor glitches, all of which were thought to be corrected, and the booster was beginning its journey to orbital insertion. At T + 23 seconds, an abrupt decay in turbopump speed and main engine chamber pressure occurred. Subsequently, an explosion was observed and the missile impacted in the launch area. Missile performance post flight analyses indicated uncoupling of the turbine. The turbine then oversped and shed its buckets due to centrifugal force—shedding of the buckets resulted in the main engine exploding. Lack of lubricant caused overheating of the turbine drive gear and consequent shearing of the gear teeth which resulted in turbine uncoupling.

How did this happen? Mishap investigation revealed:

• The lubricant's (oronite) viscosity at about 0°F is high enough to restrict its flow.

• A broken gaseous nitrogen line to an AGE heater used to control missile temperature. The line was not inspected prior to launch.

• That the lubricant line temperature would reach −20°F if reduced heating occurred because of loss of nitrogen gas from the heater unit.

• Abnormally low missile temperatures were recorded during propellant loading. No specification for lower temperature limits existed.

Had the gaseous nitrogen line been inspected, had safety or technical analyses indicated a need for the establishment of temperature limits in the missile launch criteria, or had the missile launch countdown allowed for a complete analysis of all abnormalities, this loss of USAF property would probably have been avoided.

We have now acquired this hindsight and corrective action has been taken to prevent this type of failure from recurring. As indicated, however, better foresight can go a long way toward conserving USAF resources. ★



Toots

is interested in your problems. She spends her time researching questions about Tech Orders and directives. Write her c/o Editor (IGDSEA), Dep IG for Insp & Safety, Norton AFB CA 92409

Dear Fellows:

The responsibility for accurate technical data rests with everyone involved in aircraft maintenance or operation of a weapons system. You technicians must have sound procedures in order for you to perform the job correctly. Since you are close to the job, you are most likely to note the discrepancies that exist in technical data.

You are the backbone of good tech data because it is written with you in mind. Unless you can read, understand, and follow it, there would be no need to spend money writing, revising, and updating it. Our tech data is not just so much worthless paper, but the instrument by which our equipment is operated and maintained. Technical data and you technicians are dependent upon each other and one can be no better than the other.

If the data is well written, then it is up to you to produce good maintenance; however, if the data is poorly written, you have two alternatives: (1) You can live with and work around the data and do questionable maintenance, or (2) you can get the data changed and corrected so that you can perform the excellent maintenance that is expected of you.

The method of change is the familiar AFTO Form 22. By now you all know or should know the proper procedure for filling out and routing the form, but if you do have any doubts, TO 00-5-1 Sec. 8 covers the complete procedure.

An important requirement is the telephone number of the originator. Our good friends at the depots like this information so that they can call you firsthand for information when questions arise.

So there it is, fellows. It's up to you. Use those AFTO 22s, and if you have any problems write me in care of this magazine.

Toots

EXPLOSIVES SAFETY

WANT BETTER MHE? HERE'S HOW

HY BOSCH, Directorate of Aerospace Safety

One of the most common complaints, in the explosives field, is "when are we going to improve our munitions handling equipment?" However, many of the loudest complainers have done little or nothing to get their greivances to the right people at the supporting depots. Maintenance failure data (AFM 66-1) and EUMRs (TO 00-35D-54) are the management tools available to turn complaints into action. **Problems not identified never get solved.**

DETERMINED OR UNDETERMINED?

F. P. O'GRADY, Directorate of Aerospace Safety

According to Webster, the word "determine" means "to fix conclusively or authoritatively"—in other words, "to find out."

This action—to determine—is very important when it pertains to explosives mishaps—whether accidents or incidents. The objective of each accident or incident investigation is to obtain facts, determine the cause or causes of the mishap, and to take timely corrective action which will reduce the probability of recurrence of a similar type mishap.

When the above objective is not met, the explosives accident prevention program is failing. It may also indicate that the commander of the unit involved in the mishap—all the way up to the major command—is not placing enough emphasis on the objective; that is, to determine the cause of each mishap regardless of its magnitude—whether a major accident or a minor incident!

Now, let's get down to specifics.

During the past few years, the percentage of reported explosives accidents and incidents with the cause listed as "Undetermined" has been alarmingly high! It remains alarmingly high!

As an example, 16 percent of all explosives accidents reported in CY 69 listed the cause as "Undetermined;" at the same time, 11 percent of all incidents were categorized in the same manner. The same condition existed —only higher—in CY 70. *Undetermined* was listed as the cause of approximately 18 percent of the accidents and 11.5 percent of the incidents.

The "Cause Undetermined" rate continues to be not only "high" but "alarmingly higher" as we go through CY 71. For example, the CY 71 rate through September is 21 percent for accidents and 14 percent for incidents. Of course, these percentages may change somewhat as additional data are received and computations made, but the major problem still exists.

As long as the "Cause Undetermined" condition exists, additional mishaps caused for unknown reasons will continue to occur without our knowing the specific corrective action to take to preclude recurrence. Thus, the resources of the Air Force and its combat capability are being jeopardized!

What can be done to eliminate or reduce to a minimum the frequency of "Cause Undetermined" mishaps?

Each individual—directly or indirectly involved in a mishap—whether an accident or an incident—must be thoroughly conscious of his responsibilities to determine —to find out—the actual cause of the mishap. This includes not only the person actively involved in the investigation, but also his commander—and his commander—right on up the line.

An individual may think he is taking "the easy way out" when the cause of a mishap is classified as "Undetermined." He is not! He is not only jeopardizing his own future, but the futures of others and the Air Force. He is leaving the door open for another mishap resulting from the same "undetermined" cause. The next mishap may be a catastrophe.

Let's be thorough, aggressive, and objective in our explosives mishap investigations and determine the actual cause of each and every one of them. Only then can appropriate corrective action be taken to preclude recurrence and conserve our vitally needed resources and combat capability. Are you "determined?" ★

THE PRIMARY CAUSE--YOU?

It had been a fun mission. The early morning launch to the range was always fun. It was a beautiful day. No wind on the range either, so the scores would be good. The Hun pilot maneuvered his bird for the turn to initial. The pattern was good, the touchdown perfect. It was almost time to relax when things went to hell. The bird veered sharply to the right and before the pilot could stop it the wheel was in the soft stuff off the runway. He could feel it when the strut failed . . . a wing dropped and then there was a whole lot of confusion. He was able to quickly evacuate the bird when it finally finished its slide. He stopped running when he was sure he was far enough away to avoid injury from an explosion, if it came. It didn't, but the fire trucks did, amid sirens and flashing lights, and poised their fire suppressant booms over the broken bird.

It was several days before they were sure. Mobile had confirmed that the gear appeared down and locked. the pilot sure that he had seen three green. The final determination, failure of the tire.

It isn't always this bad, sometimes we manage to stop without hurting much of anything but unfortunately any tire failure on takeoff or landing presents a very real accident potential. There was no positive way to determine exactly why the tire failed, but when something like this happens we start to question whether the pressure of the tire was within limits.

If indeed the pressure was outside of limits, how do you correct this type of error, as error it is in most cases? A recent spot check with the real world revealed some rather interesting things. When a fighter's main tire was found 90 pounds low the forms were examined to find out who had been responsible for checking the tires. He was identified and asked to explain why he had signed off the tire pressure as okay when it was obviously low. The answer was staggering, "How can I check the tire pressure? I don't even have a tire gage. My supervisor knows this but we just haven't gotten around to getting one."

This is fact, not fiction. That this particular condition exists makes you wonder about all sorts of things. If the supervisors aren't supervising, how many other items are simply signed off as okay without so much as a cursory examination? Why do things like this happen? Is it because a man is so rushed to complete the inspection that he hasn't time to do all the things on the list, so he doesn't do any?

Is it because he has determined that tire pressures are not important, so that particular check is eliminated from the inspector's "personal" list of "must dos"? If this is the case, then the supervisor needs to do a little educating.

Is it because we have so many items to check on the pre-, thru- and post-flight inspections that those items critical to flight safety are buried among less important items and, thus, none of the items are of any importance in the eyes of the airman responsible for performing the check?

For two years now the UEI teams have made a major issue of card items missed on inspection checklists, and rightly so. For here is one yardstick that tells them how well a unit functions in terms of supervision. Do these missed card items indicate that we are asking too much of our crew chiefs? If so, perhaps we need to take a hard look at what we are asking them to do and how long we give them to do it. One fact seems rather clear, there is something in the system that causes a man to perjure himself . . . he signs his name or initials to a piece of paper which says, "yes, I have inspected this item and found it to be suitable for flight." If it was not suitable for flight, he has placed the lives of the occupants of that aircraft in jeopardy.

We have no easy solution. All we can say is that there is a problem of missed card items and the problem is serious. So serious that we are losing airplanes because the inspections are not performed as required. The failure to check the tire pressure is but one example of which there are many.

If you are aware that a situation such as this exists in your area of responsibility, and have taken no corrective action, or if you have neglected items on your inspection, then you are stepping into position to be responsible for the Primary Cause of an aircraft accident. ★



Mail Call



THE LAST TO LET YOU DOWN

This is a shop motto of one of TAC's F-4 fighter squadrons. The message couldn't be clearer especially because it belongs to the Life Support section. I read and enjoy your magazine every month, but it seems that most notes or articles pertaining to Life Support shops are a list of discrepancies noted ("When You Need It, You Need It Now," Sep 71, page 16), i.e., helmets not inspected, tester not available for checking oxygen mask connectors, etc.

As a Life Support Superintendent, this makes me cringe. Not because of the article but because the discrepancies are so true and are repetitious. That's the fact and facts are easy. What's most important is WHY? Here is one possible cause found in many fighter organizations —Undermanned! Life Support technicians driving crewmembers, running ops snack bars, etc. Let's put command emphasis on management. Details are sometimes a necessary evil but keeping the Life Support technicians in Life Support, especially when they are short of troops to begin with, is imperative. Let's see some write-ups from behind the scenes. Not what, but why. Let's instill in all crewmembers from 2nd John to commander. "To Life Support they're—flyers first." How true, how true.

THE LAST TO LET YOU DOWN.

MSgt David H. Van Meter
Mountain Home AFB, Idaho

As long as we have dedication such as this, things are bound to improve.

F-102?? TF-102??

In your September 1971 issue of Aerospace Safety magazine you had a story in your Well Done Award section about two pilots who lost their windscreen while flying. I believe it said that while flying an F-102 the center windscreen blew out.

Shouldn't the story have read *TF-102?*

I read your magazine every month and find all of your stories very interesting.

MSgt Charles T. Freeman
Nellis AFB, Nevada

You're right—TF.

OUR COVER

In an effort to make our magazine more personal, we would appreciate any photographs from you in the field that might be used as a cover for *Aerospace Safety* magazine. We know that there are many outstanding color photos around that would be appropriate for publication—so send them in. Tell us the unit, people, and place involved. Eight by ten color glossies are good, but sometimes we can work from a 35mm negative. Send them to Editor, Aerospace Safety Magazine, Directorate of Aerospace Safety, Norton AFB, CA 92409. ★

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UNITED STATES AIR FORCE

WELL DONE AWARD

Presented for outstanding airmanship and professional performance during a hazardous situation and for a significant contribution to the United States Air Force Accident Prevention Program.

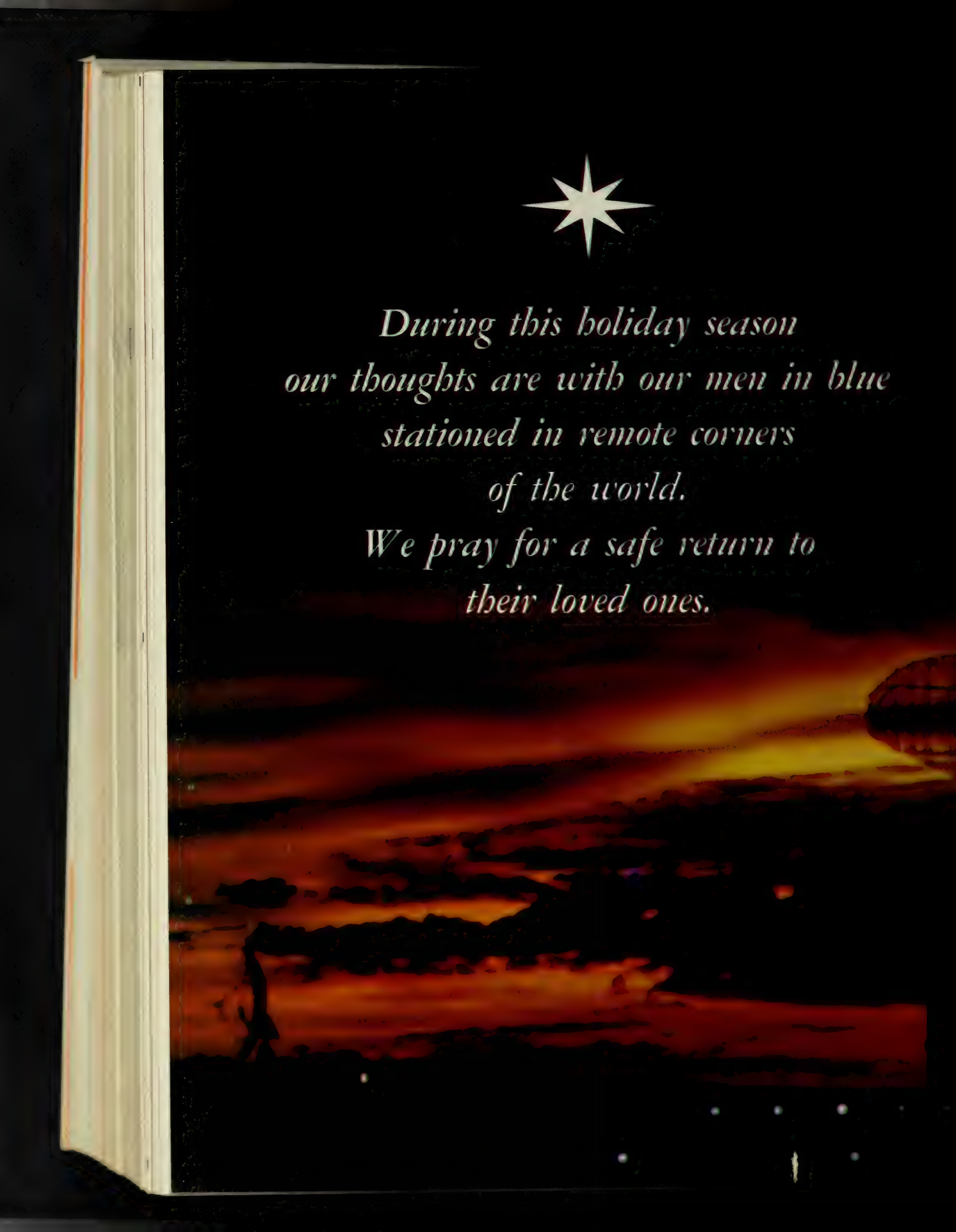
Captain JAMES D. SPEER

122 TACTICAL FIGHTER GROUP, BAER FIELD, FORT WAYNE, IND.



Captain Speer was number four in a flight of F-84s on a night refueling mission. He had just been cleared to the precontact position when the radio made a "click" noise, and shortly afterwards all the cockpit lights dimmed and went out. Suspecting generator failure, Captain Speer switched to alternate inverter and reset the generator; the warning lights then illuminated indicating the generator had failed. Using his flashlight, he made the "circle on the canopy." The flight leader declared an emergency with Chicago Center, and Greater Peoria Airport was determined as the nearest suitable recovery field. During the 25-minute recovery period the battery could not power his UHF radio. Also, the inverter became unreliable and failed which, in turn, caused the fuel flow and fuel quantity gages to be inoperative. Captain Speer had to estimate his fuel flow and manually select and time the operation on each fuel tank to prevent flameout. He accomplished this by using his flashlight and aircraft clock while maintaining his formation position. During descent the engine surged and, not having enough electrical power for an airstart, Captain Speer switched the fuel selector to the unused wing auxiliary tanks and completed a blackout landing on a 7000-foot runway.

Captain Speer's knowledge of his aircraft and superior airmanship prevented the loss of a valuable aircraft and possible personal injury. WELL DONE! ★


During this holiday season
our thoughts are with our men in blue
stationed in remote corners
of the world.
We pray for a safe return to
their loved ones.

629.1325
FLYS

UNITED STATES AIR FORCE • JANUARY 1972

Aerospace Safety





UNITED STATES AIR FORCE **JANUARY 1972**

Aerospace SAFETY

FOR AIRCREWS, MAINTENANCE & SUPPORT TECHNICIANS

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DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

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JANUARY 1972 AFRP 127-2 VOLUME 28 NUMBER 1



THE HELICOPTER Will Not FLOAT

I don't suppose that I've given too much thought to aircraft accidents. Except for monthly meetings, bulletin boards, and occasional messages, my main reaction to aircraft accidents is a feeling of profound relief that they've always happened to someone else. All pilots feel untouchable in this regard. Like the snake charmer who has such faith in his flute that he believes the cobra will never bite him. Or the sailor who's never been over on his side in a strong wind. We don't really believe it can happen to us. But it can. It happened to me.

I fly UH-1 helicopters. Our mission one day last summer was to act as safety chase for another helicopter which carried a new type rocket pod. The other bird was to check the aerodynamics of the new pod by flying through various flight regimes. The flight was scheduled over a Gulf of Mexico water range. I was to fly a loose trail formation, observing the test helicopter and its rockets, yet not interfering with its maneuvers.

Ron, my copilot, and I checked out some water survival gear on our way out to the helicopter; two LPUs and two one-man life rafts. The LPUs we planned to wear. The life rafts would be stowed just aft of the center console where they would be available if needed. We decided to fly with the cabin doors pinned open since we were to be the only two on board.

The weather was fine. Another hot, clear day. A good day for fishing, or sunning on the white sand beaches . . . or even for flying. What wind we had was gently out of the west. The Gulf waters weren't calm, but the seas were only two feet. The temperature was about 90 and we really felt it when we were in the cockpit running the checklists. It was a relief to finally get the rotor turning and manufacture some breeze. The checklists were completed with no indication of the troubles that were just 35 minutes away.

The prospect of an overwater flight in a single engine helicopter always makes helicopter pilots attentive. We don't brood about it, but the awareness of potential disaster is there. Only one thing is worse than the glide angle of a helicopter: the "sink angle." Without pontoons or sponsons they will sink spectacularly and immediately to the bottom. The Dash-one says it more bluntly: "The helicopter will not float."

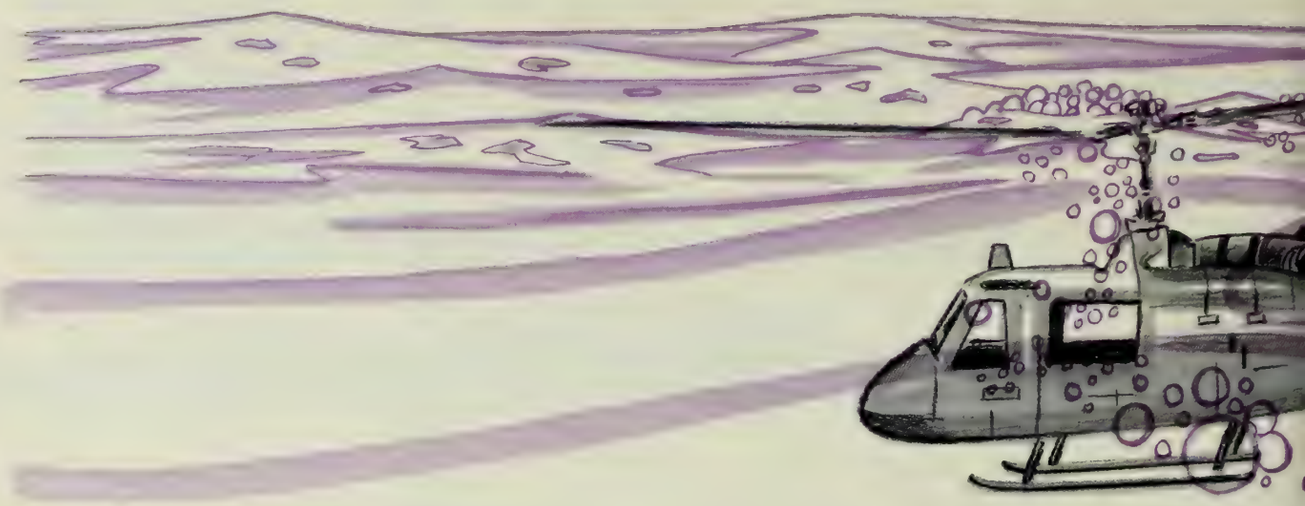
But problems of any kind seemed far away as we began the mission. The UH-1 was responding and the test mission seemed to be going well in the other helicopter. I turned the controls over to Ron after about 30 minutes, glanced at all the gages, and swiveled slightly in my seat to look back at the Gulf coast, seven miles away.

The UH-1P has an audible and visual low RPM warning system. If the engine RPM drops out of the flight range, you are cautioned by an insistent beeper in the intercom and a red light on the instrument panel. Normally it's just a strident reminder to add more throttle. It also can mean the engine has failed.

When our warning system activated, I turned back to the left and heard the other pilot say, "The engine's failed!" The helicopter sagged and started down. I took the controls. A quick peek at the engine tachometer . . . it was peeling back, now passing through 5500. From our flight altitude, 700 feet, to the water is about 20 busy seconds.

"Mayday, Mayday, Mayday!" We were on a tactical frequency with the other helicopter. "My engine just failed and we're going into the water!" I could hear the other helicopter relay to the radar controller back on land: "We've got a Mayday out here. Granger 86 has an engine failure and is going into the water."

The collective pitch was full down and I dropped the nose slightly to gain some airspeed. The rotor RPM began to increase. The beeper in my headset continued and the low warning light was still on. I thought, my God, we're really going to crash.



"We're low, you'd better start your flare," Ron yelled, and there was the water, just below the skids.

I eased back on the stick and we flared just over the tops of the swells. At what I guessed to be zero airspeed, I pushed the nose back over and pulled up on the collective to cushion the landing. The helicopter gave a shudder as the rotor RPM decayed and we settled into the water.

The salt water poured immediately into the cockpit. I let the controls go and pulled the emergency door release and the door fell off the hinges. I could hear the rotor blades still slowly turning, swish, swish. . . . Glancing to the left, I saw that Ron hadn't gotten his door open yet. (We found out later that the emergency release had malfunctioned.) Grabbing the cyclic again, I tried to tip the helicopter over on its left side so that we could climb out my door. But it was too late. A swell smashed into us and over we went. The blades hit the water and the 'copter shuddered again. I unfastened my seat belt just as the water rose over my head. The last look I got was of Ron's legs disappearing up and out his door. He'd managed to get it open at the last possible moment. (I found out later that he'd had to reach out through the window and around to the door handle and open it that way. Armor plating on the seat restricted him from quickly opening it from the inside.) I gave a push upward, standing on the side of the center console and popped up on the surface.

The helicopter was sinking and all that remained above the surface was about four feet of tail boom. I was having trouble staying afloat and remembered to inflate my LPU. The strap latch across my chest had become unfastened and when I pulled the lanyard, the LPU inflated and moved off in the vicinity of my elbows. I had to climb into the harness again. Ron was paddling about nearby and one of the life rafts was inflated near him. The other had stayed in the helicopter. My checklist also floated nearby.

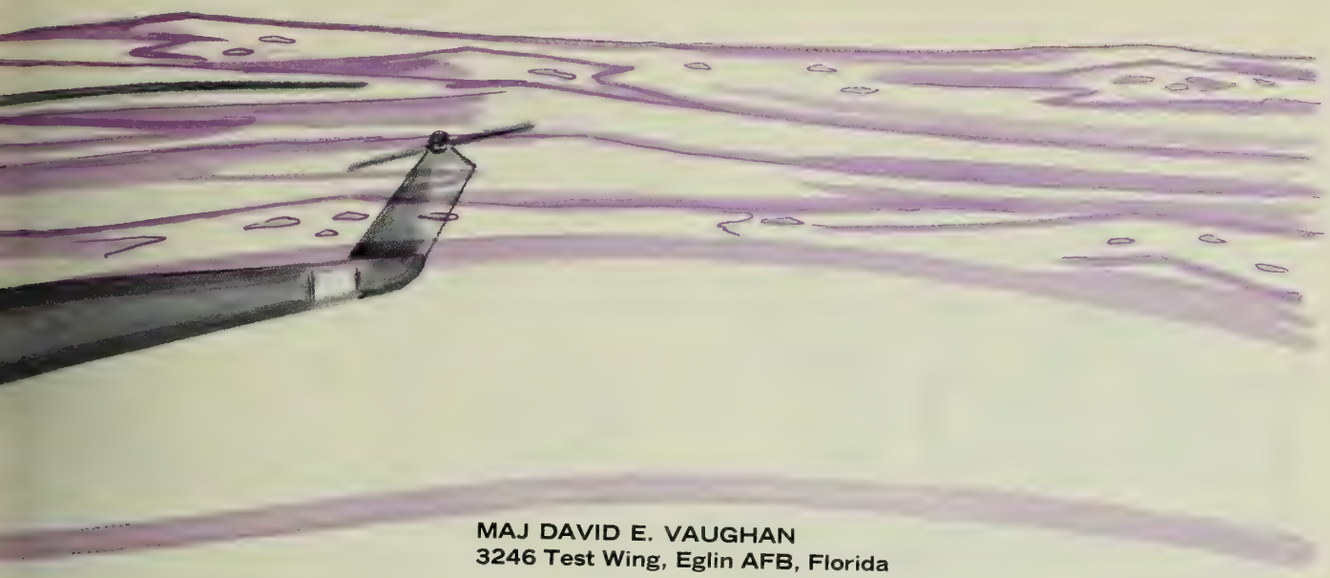
Ron and I clung to the sides of the life raft and watched the 'copter sink. I recall thinking how fortunate we were not to still be in the cockpit.

After about ten minutes in the water we were picked up by a fishing boat, the people on board adding us to a catch of mackerel and bonita.

Back at the base, the business of finding out why we were in the water had already begun. The Accident Investigation Board was forming. As we were being given checkups at the hospital, we were told to report to the Safety Office, where our statements would be taken. The hospital checks consisted of blood and urine analysis, and an extensive form to fill out regarding our activities and diet over the past three days. After completing that, we changed out of our sodden flight gear into duty uniforms and reported to the Safety Office.

During that initial meeting, four hours after we had been fished out of the water, my main emotion was still relief that I was away from disaster. The implications of having an accident hadn't occurred to me yet.

The helicopter had sunk in 78 feet of water. The Board wanted to have it raised to find out what went wrong. From their objective point of view, engine failure was only a suspected cause of the accident. Perhaps something else had gone wrong. Did the helicopter have plenty of fuel or was it fuel-starved? Did the engine overspeed to destruction through some mechanical or human malfunction? And did things happen as the pilots said they did, or was there some pilot factor in-



MAJ DAVID E. VAUGHAN
3246 Test Wing, Eglin AFB, Florida

volved in the accident? Was the fuel contaminated? Did the engine instruments all function properly or did they "trick" the pilots into their course of action? As these alternatives to what seemed to be a simple thing occurred to me, I became a bit apprehensive and also wanted very much to have the bird lifted off the bottom of the Gulf.

Four days after the crash, with the help of some frogmen and a barge, our helicopter was hauled to the surface. Salt encrusted all the metal switches in the cockpit. Four octopi had taken up residence and moved on reluctantly when the bird was raised. The altimeter had wound backward until it broke under the three atmospheres of pressure. But the helicopter was intact. The only damage was to the nose as it struck the bottom, and a broken pitch link that had snapped when the blades hit the water.

The engine, after the helicopter had been photographed from all angles, was removed and sent to a facility where it would be checked out. The Accident Board was very pleased that the helicopter could now be examined and I was too. I was sure that the cause, whatever it was, would be immediately found.

Several days later, the engine was put on a test stand and . . . it ran. The engine was run up to 87 percent and no difficulties were encountered. Perplexing news. And not designed to calm my apprehensions. After hearing that news, I spent a bad afternoon and night, wondering if, after all, I had caused the accident in some way.

The Board, except for the Flight Surgeon and his questions about my being "accident prone" and measurements of my body for his forms, had no communication with me during the investigation. I certainly didn't feel that no news was good news and tried to get in touch with someone on the Board each day.

The second day of the engine tests, it ran again. Only this time, without warning, it flamed out. The engineers conducting the tests ruled out the fuel control because the tests were done using manual (emergency) fuel. They went directly to the engine driven fuel pump. A tear down showed materiel failure in one of the drive gears causing a pressure loss and subsequent flameout.

I was extremely relieved. The Accident Board concluded its work with two days of formal meetings, hearing every witness who could contribute to their efforts. Not only the aircrew, but operations supervisors, division chiefs, maintenance men and maintenance supervisors were brought before the Board. Every possible aspect of the accident was explored through questions and answers so that sound recommendations could be made by the Board.

In the future, in addition to monthly meetings, bulletin boards, and occasional messages, my reaction to aircraft accidents will be personal concern. It can happen to me . . . or you. Here are some lessons I learned from all this:

- Believe in your emergency procedures. They *have* to be habit in a short time situation. Many bold print items are easy to memorize, but knowing how to handle the emergency (like autorotate, or complete a flameout landing) is something else. Something that requires practice.

- Know your egress procedures. How unsettling it would be to linger in your aircraft because you don't know how to make an emergency escape.

- Have faith in the Board. If you've done your job, don't worry. The Board will do theirs. ★

Why pilot error?

MODERN PSYCHOLOGY has done so much to explain the breakdown of normal human behavior (whatever that is) that we can literally get away with murder, provided we have the semblance of an excuse and a well-paid lawyer. But what has this blossoming fund of insight into the human error mechanism done to help us solve and prevent accidents which seem to originate in the cockpit?

Some have said that we should get off the pilot's back and stop using the painful term "aircrew error." We are daily reminded that our accident investigations are failures because, at best, we can pinpoint only *what* the pilot did wrong, not *why* he did it. To maintain our self respect—and our jobs—we hide our ignorance behind inoffensive recommendations that call for engineering or procedural changes. In other words, we tend to keep the pilot's halo shining by inferring that there were no bad guys in the cockpit at the time of the mishap.

Who are we fooling, besides ourselves? Do we really know so little about what makes a pilot do the wrong thing when, supposedly, he should have known better?

Let's first discuss what makes a man do his job the right way. It doesn't take a course in management to realize that we must give him the necessary knowledge, skill and tools. What is less understood is that the proper use of these three ingredients is governed by the man's attitude. Without getting involved in the tons of material written on the subject, we will say that a man has the proper attitude when he has the *willingness to use what he has learned and do what sound judgment tells him to do.* It is our contention that true aircrew error exists only where this willingness is absent—where the man follows his ego rather than his reason. We further contend that there's only one man who knows why he violated the dictates of learning and common sense —the pilot, if he's still alive.

Let's look at an example: You're driving your V-12 Jaguar down the pike between Dallas and Fort Worth. As a good, law-abiding citizen you keep your speed right at the legal limit. Your thoughts are still in the cockpit—where you got a snide remark from an approach controller about an hour ago—and you are formulating a devastating letter to the regional FAA man. Suddenly an old, rusty VW pulls alongside and pauses there, while the teenage occupants regard you with haughty smiles. A few seconds later you are staring at the ugly tail of the defiant beetle.

What are you going to do now? Your ego cries out for revenge. Reason tells you to ignore the chal-



lenge and stay in your traffic lane. Intellect, knowledge, training and judgment are smothered by the accumulated humiliations of the past few hours, and off you go in hot pursuit. As you break to the outside lane, there is a great gnashing of gears and tires—and your beautiful paint job is mixed with the ugly black and white from the patrol car chasing the VW!

THE PATROLMAN listens to your story, smiles and gives you a ticket. You protest, weakly, that he didn't have his red light on. He keeps smiling. He knows you did something against your better judgment. He doesn't care why.

Why pick a highway accident to illustrate "operator error"? Frankly, we felt it was the only way to approach a pilot's problems without aggravating him. The example is universal; it applies to any situation where, with hindsight and hidden remorse, we have to admit that we ignored our better judgment and learning.

Everyone agrees that someone with severe emotional problems should not fly. But if every pilot with marital, financial or health problems grounded himself, we'd be back in the bicycle shop where it all started. Yet it doesn't take Hollywood style stresses to make us ignore our better judgment. The slightest inflation or deflation of our ego may induce us to jeopardize human lives and costly equipment.

Suppose you're making an ILS approach and notice that you are slightly low over the middle marker. You have already decided to increase power when your copilot points an apologetic finger at the altimeter. He doesn't really want to criticize you but, at the same time, he hates to be blamed in case things go wrong. You ignore his gesture—and your own better judgment—by leaving the throttles alone. The aircraft touches down within the first feet of the runway. During the rollout you tell your assistant, "Why don't you take her on in?" with the blasé air of a man who is wasting his time on kid stuff.

What have you accomplished? Next time your copilot thinks the master of the ship is going to get in trouble he'll act like a dummy and sit bravely—and silently—through the crashing ordeal. Naturally the accident board will make some acid comments on the copilot's failure to act. But deep down in the caverns of your conscience you know that you caused this accident when you killed the concepts of team flying and shared responsibility in your cockpit.

AIRCREW ERROR? Yes, and of the purest sort. Can this type of error be uncovered by a thorough accident investigation? We doubt it. One doesn't need the Fifth Amendment to shut up and protect his ego. Can this type of error be prevented? YES! Even if we put on an act before our colleagues and the accident board, we can't fool ourselves for very long. At least once in a while —usually in the shakey aftermath of a near-disaster—we are forced to recognize the weakness in our makeup that suppresses our willingness to stick to our learning and sound judgment. But why wait for an accident to develop this self-knowledge? We can study and learn to control this judgment-destroying mechanism in practically every phase of our daily activities.

If this begins to sound like revival talk, it is simply because the true pilot error accident stands for lack of self-discipline and touches, therefore, on human behavior in general. We don't believe that a man who, with the slightest provocation, ignores his better judgment at home or on the road could be a striking example of composure under airborne stress. There's nothing that sets a pilot aside from the rest of mankind; the hallmark of professionalism in any field is discipline.

What else is there to say after beating aircrew error to death for the nth time? There is just one more admission to make: the most insidious killer in aviation—true aircrew error—may be beyond the control of safety programs and safety experts.

One man in particular, however, can rightfully appeal to the pilot's integrity, professional pride and reason: his immediate supervisor. He must do this in terms that leave no doubt about the pilot's ultimate and total responsibility for the use of his own good judgment. And, of course, he must practice what he preaches.

Beyond this, the only person who can really have an effect on the incidence of pilot error—real pilot error—is the pilot himself. Once he has been provided with the tools, training and equipment, it becomes an individual effort to use what he has learned and abide by his good judgment.

If this seems like a hopeless task, consider this: a pilot has already exhibited, to a remarkable extent, his ability to behave in a consistently rational manner—else he would not have those wings decorating his pocket.

We would venture a final wish: Let's temper that showmanship, touchiness and steely-eyed impatience in the cockpit with a strong dose of humility and self-restraint. Like a high-stakes poker game, the front office of an airplane is no place for emotional involvement. ★

—adapted from U. S. Army Aviation Digest

REMEMBER WHEN...or...



let's not forget the basics

No matter how long you have been flying, it seems as though the memories of Flying Training School endure. Remember your first flying instructor? The skill and professionalism with which he flew surely meant that he must have been flying since Pontius was a Pilate! How about when the Flight Manual was second only to the Bible—and you were not sure that seniority didn't have something to do with that anyway?

And you'll never forget the time that half the class rendezvoused at 8000 feet and had the best "hassle" that any group of 25-hour aces ever had. Of course, when you were all confronted by the Chief Flying Instructor and were told that the "discrete" frequency you had agreed upon was the bombing range frequency at another base and you had jammed out a flight of B-57s . . . you'll never forget that either! Why, then, if all these memories remain so clear, do so many pilots seem to forget some of the basic principles so painstakingly taught them?

Sqn Ldr DONALD MELVIN, RAAF, Directorate of Aerospace Safety

Don't take my word for it, though; I'll try to convince you with a few case histories.

• A C-47 was scheduled for an instrument proficiency and pilot upgrade flight over a route which basically consisted of a low-frequency airways structure. TACAN stations were sited enroute, but the aircraft was flying with an open TACAN discrepancy which had been carried forward over four flights. A limited radar monitoring service was available but was not requested; and after some initial ground communications difficulties, the crew made an IFR departure.

Station passage of a low frequency beacon was reported 12 minutes after takeoff, but intermittent contact with conrol agencies was again experienced and some minutes later was permanently lost. The aircraft was ultimately located 12 miles east of course where it hit a mountain at its assigned altitude. Both pilots were fatalities.

Reconstruction of the flight path revealed that the aircraft must have turned short of the beacon, even though station passage had been reported. A ground speed of 240 knots would have been necessary to have made good the reported position—no mean feat in a Gooney Bird.

The inherent inaccuracies of these beacons, especially under IFR conditions, are well known. But why did two very experienced pilots assume station passage four minutes before ETA? Were they distracted by the radio problems? Had they become so reliant upon modern aids that they forgot about the effects of weather on an old "bird dog?"

• A C-124 departed on an eight-hour, computer flight plan, overwater flight to a northern destination, in IFR conditions at 8000 feet. Everything was normal at the last call received 30 minutes before ETA. Then, contact was lost. It took three days for the weather to clear enough for an effective airborne search to be made. The wreckage was located at the 8000-foot level of a glacier on an 8215 foot volcano. This volcano was only eight miles to the right of the flight planned course.

Investigation revealed that the aircraft commander and the navigator had accepted a computer plan which was obviously designed for high altitude, and which offered no obstacle clearance guidance. The inadequacies of the computer plan were brought to their attention, and they agreed to, and filed for, and en route altitude of 10,000 feet. As soon as they were comfortably en route, however, they requested a descent to 8000 feet! The navigator had received a specific briefing on the high terrain surrounding destination prior to departure from home base, and had even gone to the trouble of obtaining an ONC chart of the area. Why, in the face of all this did they *insist* on an en route altitude well below MEA and even below the minimum altitude for reliable nav-aid reception? ? ?

Both these accidents could have been prevented by the application of *basic* navigation principles.

We spoke of Flight Manuals. Here are three cases where disregard of specific warnings caused loss of life and aircraft.

• A U-10 aircraft was returning to its home base on a routine cross-country proficiency flight, but was forced to RON at an intermediate stop because of destination weather. The next day the AC called his base, but was told the weather was still unsuitable and to check again in 24 hours. Despite local low ceiling, high winds, and forecast icing, the AC departed IFR on the third day without contacting his base! Soon after takeoff, the pilot requested a lower altitude as he was encountering icing conditions. A few minutes later he requested the lowest altitude available but was informed that he was already there. The aircraft was next observed by ground witnesses when it appeared beneath a low cloud bank. They commented upon its pitching and rolling motions and the abnormal engine noise before it nosed sharply into the ground and was destroyed. The three crewmembers were killed.

The primary cause was determined to be operator factor in that the pilot disregarded a warning in the Flight Manual and filed and flew into forecast icing conditions. The result was loss of power and aircraft control.

Two other cases involved C-123K aircraft performing identical maneuvers. The first aircraft executed a steep rolling pull-up after a low altitude, high-speed pass as part of a demonstration flight. At the apogee of the maneuver, with approximately 90 degrees of bank, the nose rapidly dropped and the aircraft rolled to a near vertical attitude. Recovery was impossible even though the pilot overstressed the aircraft to a point where the horizontal tail surfaces failed. Tragically, 17 crew and passengers were killed.

CONT'D

The other UC-123K made a low pass and pulled up parallel to the active runway. An identical flight condition ensued, and the aircraft crashed on the airfield in a near vertical attitude. This troop had resolved to be really spectacular, as during the course of the investigation a smoke grenade was found wired to the rear of the fuselage, and he had mentioned trailing smoke to some friends the evening before the accident. Five crewmembers perished.

A look in the Flight Characteristics section of the Dash One will reveal a warning note prohibiting power-on stalls, because no aerodynamic warning precedes an abrupt roll and downward pitch. Therefore, the high angles of bank (increasing the stall speeds by as much as 300 percent) and rapidly decreasing airspeeds placed the unwary pilots in an almost inextricable situation. The best guidance in the world is wasted unless it is heeded.

For the grand finale, a mishap falling into the category of an accident looking for a place to happen.

A C-47 was scheduled on a round-robin passenger mission to depart early morning and arrive back at base early evening. The first two legs proceeded normally, but the terminal forecast for the third leg back to their departure field (commercial) was 100 feet, one-half mile, rain or snow showers, and fog. This was confirmed by the duty forecaster at an Air Force base near the field. The AC decided to proceed to destination and attempted an ILS in WX conditions that were as forecast. A missed approach was executed and a second ILS attempted although the weather was still below minimums. A missed approach was again accomplished and the aircraft was cleared to hold at the ILS outer marker. Some 23 minutes later, the aircraft was cleared for a third ILS. A normal report was made at the outer marker, and witnesses then observed the aircraft descend through low clouds to the left of and at an angle to the runway. It banked slightly right and power was heard to be applied, but definite engine roughness was apparent. Before a climb was established, the right wingtip struck the ground, the aircraft crashed and burst into flames. The four crewmembers and one passenger all died.

The investigation revealed several circumstances which, although individually not responsible for the accident, cumulatively indicated a high accident potential.

a. Both pilots had 15½ hours crew duty at the time of the crash. However, they had only six hours bed rest prior to reporting for duty. So a fatigue element was present.

b. Neither pilot had provided for inflight meals, and neither was known or observed to have eaten any solid food on stopovers.

c. The AC did not report to Base Operations for any of the preflight briefings or preparations. He proceeded directly to the aircraft shortly before scheduled takeoff time.

d. The passenger traveled the entire flight without any record being made on a manifest or other document.

e. The AC had glasses prescribed for flying, but had been observed by a number of former crewmembers to still have visual acuity problems. This was neither reported to nor known by the flight surgeon.

f. No report was made to the AFB command post approaching destination, as required by directive.

Examination of the wreckage indicated that the mixture levers were in auto-lean, propellers most probably at a 2150 rpm setting, and the carburetor heat full cold. It was obvious that cruise configuration had been established during the holding patterns, but that the before-landing checklist had not been accomplished prior to final approach.

A tail wind component of 18 knots during the approach, coupled with the prevailing temperatures, dictated a power setting at which carburetor icing would almost certainly occur. The combination of engine detonation (high boost/low rpm/lean mixture), carburetor icing, a density altitude of 6000 feet, and the 20 degree bank angle made the go-around an impossible maneuver. The FAA flight checks of the localizer on record indicated that it broke sharply left below decision height, and this accounted for the displacement of the aircraft when it broke through the clouds.

The primary cause was assessed to be pilot factor in that the pilots failed to properly configure the aircraft, descended below decision height in IFR conditions, and subsequently placed the aircraft in a position from which they could not recover. What made them persevere with repeated approaches when they had adequate fuel for flight to a clear alternate even when they crashed? Why did they choose to attempt a landing in those conditions with an 18 knot tail wind to complicate the issue?

All the pilots involved in the mishaps described had many things in common. All had been assessed as mature, responsible individuals who either held IP/FE status or had been selected for upgrade. They were flying "docile" aircraft on routine missions, not pushing modern aerodynamic marvels to their limits. But they all perished due to fundamental errors—basic navigation, not heeding the Dash One, descending below minimums, and others you can no doubt identify.

It is not suggested that we should return to flying school thinking—that would be a retrogressive step. That indefinable term—airmanship—enables us to make decisions based upon experience, knowledge, skill, and many other factors. However, there are certain fundamental truths which respect only common sense—so *"let's not forget the basics."* ★

Ricochet



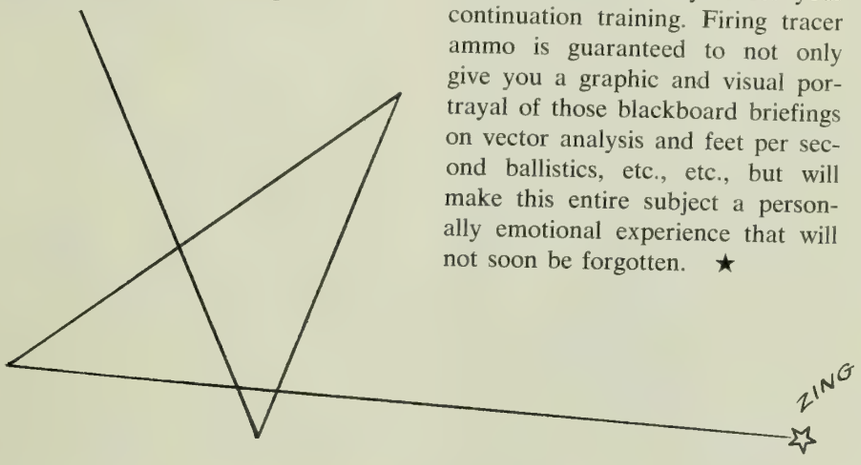
LT COL JAMES D. DUNN
Directorate of Aerospace Safety

KER ZING! If you could hear them or if there were some way to convert those training projectile ricochets into tracers that you could see, you'd know that you've been encountering some pretty heavy flak on those ho-hum range missions. Although we've moved the foul line back and up and given increased attention to film assessment programs, we still have ricochets and, more important, ricochets that hit aircraft. In fact, it appears that our aircraft are encountering more ricochet damage today per round fired than ever before.

Why? That's a good question. Maybe we can blame the heavy saturation effect our ranges have been exposed to with the SEA commitment of the last five to seven years, coupled with an accumulation of many projectiles which have not been picked up due to limited policing times or inadequate equipment. Perhaps soil composition, temperature, and humidity can somehow combine to deflect rather than absorb projectiles under certain conditions, especially the higher velocity 20mm.

The extremely heavy use of the new acoustical scoring targets (any flight of four likes to know who's the beer buyer while still airborne, right?) and their general lack of portability to another panel may also be a factor. But whatever the cause, we do know that ricochets pose a real accident potential to our weapons system resources and aircrews. We also know that ricochets not only can knock out your engine, but they can cause you to lose your canopy; and at 400+ knots on the deck, even if you're not seriously injured, it's questionable whether you can maintain aircraft control.

So how about it? Next low angle strafe mission, talk about the problem. If you don't have or use the double visors on your hard hat, you're missing some good insurance. And if you really want to reduce your exposure rate, ask the armament officer to procure enough tracers so that you can load 100 percent on that first strafe training mission and once a year for your continuation training. Firing tracer ammo is guaranteed to not only give you a graphic and visual portrayal of those blackboard briefings on vector analysis and feet per second ballistics, etc., etc., but will make this entire subject a personally emotional experience that will not soon be forgotten. ★



WOW!! IT WORKS!



The prospective passenger arrived at flight operations for his first orientation ride in the OV-10, and was sent to the Life Support section to pick up survival gear. There he was briefed on the operation of life support equipment and the OV-10 egress system.

The passenger and the pilot then walked to the aircraft, where the pilot personally strapped the passenger into the rear seat, reviewing with him the briefing on the egress system. Specifically, he cautioned the passenger not to pull the D ring unless told to do so.

The pilot then got into the front seat, strapped in and started his engines. After removing the safety pin, he directed the passenger to do the same. The passenger stated that the pin was a little snug but with a little jiggling he was able to remove it. He took the pin and the attached strap and was reaching for the thruster safety pin on top of the instrument panel. Suddenly he smelled something burning, heard a hissing noise and was ejected out of the cockpit! The ejection was successful, and the passenger landed 48 feet away, with no serious injury.

The conclusion of investigators was that the passenger pulled the D ring and S.I.E.'d (self-induced-ejection). Examination of the seat showed that both initiators in the dual system had fired with the activating pins pulled. The graduated metal flanges on the seat-activating D ring handle were bent and broken in such a way as to indicate that the D ring was UP at the time of impact.

Investigation points to the following sequence of events: As the thruster pin end of the streamer was placed on the instrument panel, it became lodged on the metal flanges of that panel. The streamer was then routed either through the D ring handle or in such a way as to become tangled with the handle when the D ring safety pin was removed. When the passenger attempted to secure the seat actuating pin, he raised the seat pin end of the streamer to the height of the instrument panel—creating, in effect, a movable pulley arrangement (with the thruster pin end lodged in the flanges atop the instrument panel) which would enable the passenger to lift the D ring and actuate the system with roughly half the force normally required.

The passenger stated later that he was unaware that the thruster safety pin was on the other end of the seat pin streamer. He also stated that he had not actually sat in the seat during his life support briefing (the seat was TDY to another location for aircrew training).

Several questions come to mind:

- Was the original life support briefing adequate without the practice seat available?
- Was the pilot's briefing detailed enough to make up for the inadequacy of the life support briefing?
- Was this passenger really mission essential?

The corrective actions taken and recommended indicate a "no" answer in each case. There was a lot of slack in the system, and nobody bothered to take it up —until after an accident. ★

REX RILEY'S CROSS COUNTRY NOTES

876-2633 AUTOVON

Last year we made some great strides in the quality of transient service provided by almost all of our bases. To make this year even better, I'll review some of the major points that determine a base's qualification for inclusion on the "Recommended List."

Attitude: In almost every case this one factor is the most important in Rex's evaluation. All areas of a base may be up to snuff, but if the attitude of the troops we come in contact with is one that makes us feel they are doing us a favor by providing fuel or a place to sleep, then they just have to lose points.

TAQ: This is another area we hope to improve in 1972. I've seen good and I've seen poor quarters but, unfortunately, I can't see all of them. So, we'd appreciate a note from *you* letting us know about those bases that excel as well as those that need some attention.

Refueling: Not every transient uses the "Qs" but just about everyone needs gas. The quality of fuel service is an obvious indicator as to how much attention is given to transient facilities by the commander. A two-hour delay for fuel tells me that nobody cares about *my* mission. I was caught several times last year by exercises—this is a way of life—but it still makes me wonder if one fuel truck could not be labeled "transient" and reserved for such contingencies.

Transient Questionnaire: I know of one base that makes effective use of comments by transient crews. Each relevant report is aired at the Air Traffic Control board meeting. I was impressed with the coordination this fosters between Tower, RAPCON, and Base Ops. Of course, it's hard to do this unless you have the questionnaires readily available at Ops. Does your base?

Your Job: One of the comments from a transient type in a recent letter to Rex goes something like this, "How can you justify keeping this base on the List? They are terrible." If Rex's only job was flying from base to base evaluating, it would still be impossible to get to everybody. So it's up to all transient crews to let me know when you are dissatisfied *or* happy about your treatment. Keep me informed; I'm as close as your telephone. Your comments determine who goes on and who comes off my List. With your help, maybe we can clear up all the transient shortcomings and make all our facilities outstanding by the end of '72. ★



REX RILEY
Transient Services Award

LORING AFB	Limestone, Me.
McCLELLAN AFB	Sacramento, Calif.
MAXWELL AFB	Montgomery, Ala.
HAMILTON AFB	Ignacio, Calif.
SCOTT AFB	Belleville, Ill.
RAMEY AFB	Puerto Rico
McCHORD AFB	Tacoma, Wash.
MYRTLE BEACH AFB	Myrtle Beach, S.C.
EGLIN AFB	Valparaiso, Fla.
FORBES AFB	Topeka, Kans.
MATHER AFB	Sacramento, Calif.
LAJES FIELD	Azores
SHEPPARD AFB	Wichita Falls, Tex.
MARCH AFB	Riverside, Calif.
GRISSOM AFB	Peru, Ind.
CANNON AFB	Clovis, N.M.
LUKE AFB	Phoenix, Ariz.
RANDOLPH AFB	San Antonio, Tex.
ROBINS AFB	Warner Robins, Ga.
TINKER AFB	Oklahoma City, Okla.
HILL AFB	Ogden, Utah
YOKOTA AB	Japan
SEYMOUR JOHNSON AFB	Goldsboro, N.C.
ENGLAND AFB	Alexandria, La.
MISAWA AB	Japan
KADENA AB	Okinawa
ELMENDORF AFB	Alaska
PETERSON FIELD	Colorado Springs, Colo.
RAMSTEIN AB	Germany
SHAW AFB	Sumter, S.C.
LITTLE ROCK AFB	Jacksonville, Ark.
TORREJON AB	Spain
TYNDALL AFB	Panama City, Fla.
OFFUTT AFB	Omaha, Nebr.
ITAZUKE AB	Japan
McCONNELL AFB	Wichita, Kans.
NORTON AFB	San Bernardino, Calif.
BARKSDALE AFB	Shreveport, La.
KIRTLAND AFB	Albuquerque, N.M.
BUCKLEY ANG BASE	Aurora, Colo.
RICHARDS-GEBAUR AFB	Grandview, Mo.

FLIGHT

VERNET V. POUPITCH, Directorate of Aerospace Safety

A study of flight control malfunctions indicated that in recent years the annual cost to the Air Force has been 58 million dollars. The figure covered the loss of aircraft with flight control failure as well as secondary damage to other aircraft in flight or on the ground as a result of the original failure.

Flight control system failures frequently result from design deficiency. In a recent study of accidents attributable to design deficiency, flight control failure led the list (Fig. 1).

Flight control failure is particularly critical in today's high performance aircraft. Therefore, it is necessary to provide protection to the basic system in terms of multiple redundancy in relevant mechanical, electrical and hydraulic systems. This becomes a challenge of major proportions on smaller aircraft because of limited space. Nevertheless, it is essential and this feature is being incorporated into a new fighter.

To give you an idea of what we mean by design deficiency, the hydraulic actuators on one aircraft were designed with a common wall between two systems. Cracks in the common wall went undetected until an external leak developed, culminating in complete loss of both systems. The crew was forced to eject. Unitized construction had saved weight—at the cost of an airplane. (This was just one of several such cases, and there were others in which the crews got the aircraft home.)

Protection of electronic systems from the environment by shielding and sealing is vital. There have been many reports of moisture entering electrical components, with serious results. When this happens in an automatic flight control system, an event such as the following might occur:

> **A fighter on takeoff rolled right when left rudder was applied. Water was found under the rudder summing network module located at the base of the autopilot calibrator.**

Detailed study of autopilot reports discloses severe pitch-ups during formation, porpoising during tanker refueling, controls oversensitive, hard rollovers, lateral oscillations and violent noseover occurrences during intercepts. Some of the known causes were:

- Wires shorted, corroded or occasionally making contact.
- Defective autopilot amplifier.
- Channel out of trim.
- Rate gyro out of adjustment or failure.
- Yaw canceller malfunction.
- CADC signal erratic.
- Coupler failures.
- Unknowns—spurious signals that couldn't be traced.

Weight is always a major consideration in aircraft system design and when other aspects are involved tradeoffs must be made, but with prudence. For example, while most modern aircraft use steel tubing on the pressure side of the hydraulic system, aluminum tubing is frequently used on the return side. Both tubing and fittings of these return lines are subject to fatigue, and in event of fire, offer negligible resistance to fire damage. Also, failure of the return system can result in complete loss of fluid. Therefore, for maximum safety and reliability, it is desirable to use steel or a fire resistant material for both the pressure and return lines.

Moreover, we must so route hydraulic tubing that failure of an adjacent or remote linkage, an actuator support, flap or speed brake will not sever the tubing. A late model aircraft was lost when a speed brake actuator attaching bracket failed, severed the bundle of hydraulic tubing, and caused loss of flight control.

To obtain maximum aircraft performance we resort to high lift devices—slats and flaps. One modern aircraft has 42 movable aerodynamic surfaces in the high lift device system. Simplicity of slat and flap systems is difficult to achieve, but it is mandatory in order to obtain a high reliability factor. Symmetry, of course, is critical but we do not always achieve it because of failures of the drives, linkages, actuators, and structural failure of the attaching brackets. For example:

> **When the flap handle was raised after takeoff, the aircraft rolled left. Control could not be regained. Primary failure of the flex cable permitted an uncontrollable asymmetric flap condition. The contributing cause was design deficiency of the asymmetrical flap detector system.**

Design deficiency combined with maintenance malpractice can be a disastrous combination. Numerous

CONTROLS

aircraft have been lost because of crossed controls. The flight control system, whether conventional or fly-by-wire, must be designed so that control linkages, wiring, etc., cannot be improperly connected. Failure to do so could lead to disaster; for example:

> **The flight controls on a fighter froze and the pilot ejected. The primary and secondary pressure hoses were found reversed on the rudder actuator. Reversal of the hoses depleted the primary hydraulic system and caused primary pump failure followed by depletion of the secondary system and subsequent pump failure. The actuator hydraulic fittings were identical.**

Disconnects are another cause of numerous aircraft accidents. Loss of bolts in control system connections has made the use of self-retaining bolts at critical points mandatory. *No case is known where a fastener secured properly with a nut and cotter pin loosened.* Yet, we have a history of disconnects.

> **Fighter aircraft rolled to the right. No corrective measures were effective. The pilot ejected. A bolt connecting the auto pilot roll impulse rod to the right aileron actuator control bellcrank disconnected. The nut was not safety wired during overhaul.**

One solution to the maintenance problem lies in packaging. For example: Package the related assemblies into plug-in type hermetically sealed modules. Then, in the event of a component failure, only the readily replaceable, plug-in, sealed module would be replaced in the field. Plug-in connections could be made simultaneously with electrical, mechanical, and hydraulic connections. No adjustments would need to be performed by line personnel, who would merely replace the sealed units. Repair, overhaul, replacement and adjustment of the components in the module would be performed only in a shop-controlled environment by highly skilled shop personnel.

A larger inventory would be needed, or a rapid repair cycle established, to logistically support the module concept, but the savings in aircraft would justify it and maintenance error would be virtually eliminated.

We have been successful in reducing the number of accidents in all cause factor areas. As we continue to reduce the human factor, we must keep pace in the materiel area. This includes improvements in design, even to the point where design precludes mistakes during maintenance. The challenge is great but the rewards will be commensurate.★

FLIGHT CONTROLS

Flight Controls	24%
Engine	14%
Fuel System	13%
Structure	13%
Landing Gear	10%
Brakes, Hydraulics, Electrical and Miscellaneous	26%

Fig. 1. Design Deficiency Cause Factor Accidents

They Said "IT" Couldn't Be Done



The Hairy Tales column is open to anyone who has a message concerning safety, but would like to remain anonymous. If you have one of these experiences buried in your bosom, write it down and send it to us, signed or unsigned. Maybe your HAIRY TALE will save someone's life.

I've been procrastinating for weeks now, but I can't seem to forget "it," so I'll tell about "it" in the hopes that "it" won't happen to you. Then maybe, at least, something positive will come of "it." Here goes

I'm the flight commander of a two-ship, weekend student cross-country. I've been around five years, 2500 hours, and can look back on several "its," most of which are not so vividly intimate. I thought "it" didn't happen anymore, at least to professionals, and for sure not in my outfit.

We're late and had to get airborne prior to sunset. Center didn't have our stop-over clearance and we were hacked off because we didn't get any approaches. After landing we ran into base ops and on the way asked the fuel truck to get us first since the "thud" parked between us was RON.

We came back out and the fuel truck was just finishing my bird. I called to the other guys to expedite. I took off on the wing this leg and we launched into the fading twilight for—you probably guessed —Las Vegas. Just after we got airborne, lead began a very abrupt 180 back to the east where it's black and there's mountains—and I lost him. I called on departure frequency, then Guard—nothing! I looked for a flash of fire—nothing. I called tower and they said they thought he just landed but he was not talking. I returned and landed. Lead was on the ground, thank God.

You probably still haven't guessed "it" unless you started at the end of this story. The fuel truck skipped his aircraft and he took off with no gas! The fuel-low light and master caution came on just after liftoff and this was his first realization that all he had was fumes in the tanks.

You say inconceivable? We have 781s, checklists, we all look at those gas gages several times before liftoff. "It" happened to a well qualified, well thought of IP, a good head, who doesn't make mistakes. "It" could have been a catastrophe. ★



HOW FAR can you see?

We thought by now that everyone was familiar with the terms we use to describe how far we can see. A quick check around the flightline proved us wrong, though—a few pilots still get them tangled up. Here, then, are some handy definitions of terms, couched in language any jock can (hopefully) understand.

Visibility is the distance at which objects, such as trees or houses, can be distinguished as such. This distinguishing is made from a stationary platform, however, and probably by someone who is not particularly excited about it. Any correlation between this distance and the distance at which a pilot peering through the murk can distinguish the profile of a strange airfield is purely speculative.

Prevailing Visibility is the greatest horizontal visibility through at least half of the horizon circle. As examples, let's look at two hypothetical situations: in figure A, by definition, prevailing visibility is seven miles; in figure B, prevailing viz is two miles. From these examples, you can appreciate the problems involved in trying to give you, the pilot, a truly representative visibility value—either as an observation or a forecast.

NOTE: Neither of these values relates, in any predictable way, to inflight visibility. And that arch-villain, slant range visibility, has so many variables (such as approach speed, pilot fatigue, windshield geometry and angle of approach) that it is virtually impossible to anticipate.

Runway Visibility (RV) is that value, derived visually or by instrument, that best represents the horizontal distance someone can see along a particular runway. This value is reported *only* if the prevailing or runway visibility gets down to one mile or less.



Runway Visual Range (RVR) also tells you how far someone can see down a particular runway, but RVR is derived differently. This time the data come from sensors along the runway which are calibrated with reference to high-intensity runway lights or other targets of great visual contrast. RVR is taken as a one-minute average and a ten-minute average, and is measured in hundreds of feet. Both averages are transmitted locally for use by air traffic controllers, but only the ten-minute average is sent to other bases for flight planning purposes.

Now do you see? ★



FIG. A

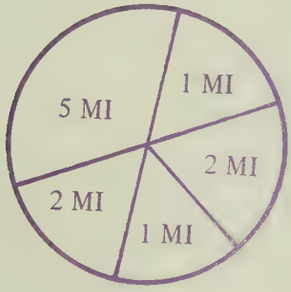


FIG. B

THE I.P.I.S. APPROACH

By the USAF Instrument Pilot Instructor School, (ATC) Randolph AFB, Texas

ILS GLIDE SLOPE

Q What is the significance of an underlined glide slope intercept altitude on an ILS approach chart?

A The legend page of the low altitude instrument approach procedures booklet explains this one. "Glide slope intercept altitude is the same as the minimum altitude over the LOM for localizer only approach, except as noted." Unless a different final approach fix altitude is designated, maintain the published glide slope intercept altitude until past the localizer final approach fix.

Q Does glide slope intercept altitude also apply to other approaches, such as VOR or TACAN, published in conjunction with the ILS?

A Yes. Unless there is a specific FAF altitude published, the published glide slope intercept altitude is a minimum altitude until passing the final approach fix for a non-precision approach. For example, consider a VOR/ILS approach with ILS, LOC, VOR, and circling minimums published, and no specific final approach fix altitude designated. When flying either the LOC or VOR approach, maintain the glide slope intercept altitude until past the FAF.

AFM 60-16

Q AFM 60-16 allows me to file to a base and begin an approach under "visibility only" criteria. Does this also allow me to take off using visibility only criteria?

A Yes. "In the absence of command-established takeoff minimums, no takeoffs are permitted when existing weather is below applicable landing minimums suitable for use by the aircraft concerned." (AFM 60-16, para 8-9a.) The weather is below landing minimums when the *visibility* is less than that specified for the applicable procedure. (AFM 60-16, para 8-15a and para 8-16.)

BELOW MINIMUMS

Q I have initiated an instrument approach and the visibility goes below minimums. In lieu of descending to the proposed MDA or DH, may I fly the final approach course descending no lower than final approach fix altitude?

A Yes. We know of no possible conflict that would arise in this situation. Traffic separation would be provided both at FAF or MDA/DH altitude. However, if your MAJCOM supplement to 60-16 authorizes you to descend to minimums, you would be depriving yourself of the possibility of landing even though the visibility is *reported* as below minimum.

INSTRUMENT FLIGHT

Q Under what conditions may I log instrument time in the 781?

A AFM 60-1, Attachment 6, defines instrument flight as "Flight conducted in weather conditions that do not permit flight with visual reference to the horizon, ground, clouds, or water." The pilot must determine when these conditions are met.

TCAs

Q Where can I find information on Terminal Control Areas?

A Newly established TCAs are depicted in the Special Notices and Procedures section of FLIP II.

They are published there for three issues and then "incorporated with other data." Other data right now means the new VFR terminal area charts (available from commercial sources). TCA charts are also published by the National Ocean Survey and are available at Navy base operations facilities. Graphic portrayals of individual TCAs, their effective dates and operating rules and procedures can be found in the Airman's Information Manual, Part I and Part III. You can avoid the issue completely by operating under IFR while within TCAs.

HANDY HINTS

Ever been strapped in your bird and suddenly found that you need something to write on right now? Most well-equipped pilots will have some scratch paper, an extra Form 70, or an old SID that will serve the purpose. If those sources fail you, try one of the approach booklets. There are usually six or eight blank pages in the back which will serve nicely for note taking, clearance copying, and other purposes. It also saves a lot of doodling on enroute and approach charts.

AFM 51-37

By this time, the new issue of AFM 51-37, *Instrument Flying*, should be in your hands. Virtually the entire manual has been rewritten. For this reason it would be impractical to attempt to list all the changes and the rationale behind them in this article. All changes were made with you, the pilot, in mind. The basic objective was to simplify procedures where possible and to clarify wording which was susceptible to misinterpretation. We sincerely hope that this manual will satisfy the needs of the using agencies. Please help us keep this manual current and responsive to your needs. We encourage your use of the AF Form 847, Recommendation for Change of Publication, for this purpose. ★

GEN SPRUANCE EDUCATION AND TRAINING AWARD

SMSgt Thomas W. Linam, Jr., Colorado ANG, was honored for his contributions to aircrew safety when he was awarded the General Spruance Education and Training Award at the Ninth Annual Symposium of the Survival and Flight Equipment Association. The award was based on SMSgt Linam's many innovations in creating a realistic training program for pilots in ejection and emergency ground egress procedures.





LT COL GERALD A. JONES
Directorate of Aerospace Safety

Supposedly, all helicopter drivers are aware of the effects a tailwind or downwind condition can have on aircraft performance during takeoff or approach. However, occasionally we find the need to review and reemphasize these effects. The following are summaries of two recent accidents which occurred during downwind operations:

A CH-3E was on a mission to airlift personnel into and out of a helicopter landing zone (HLZ). The HLZ was approximately 300 feet by 100 feet, surrounded by trees approximately 75 feet high, and oriented to the northeast on slightly rising terrain. An approach was made to the center of the HLZ into an eight to ten knot wind from the northeast. After the transfer of troops was completed, the aircraft commander brought the helicopter to a hover, backed up slightly and turned to the west-southwest to make a downwind takeoff toward slightly lower terrain and trees. He lowered the nose of the helicopter and began a slow acceleration and climb. Within seconds the rotors began contacting several small trees near the edge of the HLZ. A right turn was made to take advantage of lower trees, and acceleration reached 10-15 knots groundspeed. At this point the aircraft passed the edge of the HLZ and the ground effect was lost due to the steep drop in terrain. Having insufficient power to remain airborne without ground effect and not having reached sufficient speed to gain translational lift, the aircraft settled into the trees. The aircraft commander and four others died in the crash and ensuing fire.

In another accident, an HH-3E was on a mission supporting training of survival students in vectoring rescue aircraft by use of emergency radios. Several signal evaluations had been flown and on this evaluation the vector resulted in a seven to 15 knot tailwind. The altitude was 250 to 300 feet AGL, and the airspeed was approximately 65 knots with the aircraft descending at 200 to 300 feet per minute with power at 35 to 40 percent torque. The aircraft continued this flight path toward slightly rising terrain for approximately 1200 feet. When approximately 100 feet above the ground and at an airspeed of 45 to 50 knots, a 20 degree nose up attitude was assumed. This attitude caused a near zero airspeed and a settling condition was encountered. Power was increased; however, the nose was not immediately lowered. Full power, 110 percent torque, was subsequently used, and the nose was lowered, but not in time to arrest the descent prior to contact with a tree and gully bank. The aircraft suffered major damage and the aircraft commander received major injuries. The copilot and the helicopter mechanic received minor injuries.

In each of these accidents, the downwind condition played a signi-

SCRATCH TWO... downwind

ficant role. In the first case, shortly after the accident, another CH-3E at the same gross weight departed the HLZ into the wind without a problem. In the second case, although the unchecked settling condition was the real culprit, the downwind condition may have been the final deciding factor.

In many cases the true effect of a downwind condition can be deceptive. If we note the effect of a tailwind on power required to hover, it may not appear to be significant; however, trouble begins as we move forward on takeoff. In a stationary hover with a ten knot tailwind, we are in effect flying backwards at ten knots. To attain translational lift airspeed of approximately 20 knots we must accelerate 30 knots as opposed to only 10 knots with a ten knot headwind. Obviously considerable more distance will be required for a downwind takeoff under limited power conditions. If we attempt to shorten this distance and climb prior to attaining translational lift, we will find ourselves in the situation encountered by the pilot in example number one. Without translational lift and out of ground effect the power required to remain airborne will approach that required for an out of ground effect hover. And if we don't have this capability, we can't stay airborne.



Our problem during an approach with a tailwind is somewhat reversed. Here we are concerned with the loss of translational lift before entering ground effect. We normally fly an apparent ground speed during an approach. Consequently, we can easily find that we are below translational lift airspeed while well above our ground effect altitude. Here also the power required can greatly exceed power available. Although we will pick up ground effect as we approach the hover, a high rate of descent may develop which cannot be arrested in time to prevent ground contact.

We can compensate for this, somewhat, by maintaining our airspeed above translational lift until we pick up ground effect. But then we will be concerned with the problems of stopping the helicopter while at a lower altitude and with a relatively high ground speed. We may be risking tail rotor-to-ground contact or a possibly dangerous overshoot.

In short, downwind approaches and takeoffs should be undertaken only when absolutely necessary and operationally justifiable. And certainly only after we have assured that it can be done with complete safety. Even then, we must continue to bear in mind the increased criticality of a power loss while downwind at a low altitude and airspeed. ★

air force's new fire resistant

HYDRAULIC FLUID

GUS S. ECONOMY, Directorate of Aerospace Safety

The familiar red hydraulic fluid (MIL-H-5606B) has been with us a long time—since 1945 to be exact. As a hydraulic fluid, it has done its job well, but it has always had one significant drawback. *It is highly flammable.* Its fire point is 225°F, only a few degrees above the boiling point of water.

Fires involving hydraulic fluid have cost the Air Force millions of dollars and several lives. Because of this, a replacement for MIL-H-5606B with a fire resistant hydraulic fluid has been researched for many years. Many candidate fluids were considered which did have excellent fire resistant properties. However, technical problems existed such as compatibility with existing aircraft hydraulic system components (seals, pumps, actuators), lubricity, high and low temperature requirements and other properties. A fire retardant fluid presently used in commercial aircraft was also considered. However, it was not compatible with present Air Force hydraulic system components.

A new hydraulic fluid has been developed and is designated as MIL-H-83282, Hydraulic Fluid, Fire Resistant Synthetic Hydrocarbon Base, Aircraft. Compatibility problems with Air Force existing systems have been overcome and MIL-H-5606B fluid in current aircraft can be replaced merely by draining, flushing and refilling with MIL-H-83282. Compatibility of the two fluids has been resolved to the extent that no intermediate flushing fluid is required.

Results of tests such as gunfire, flash and fire-flame ignition and flame propagation have been very satisfactory. Operational evaluation in test aircraft has been very successful. (Tests are still in progress and additional tests have been programmed.) Some of the significant comparative hydraulic fluid oil properties are listed in the accompanying table.

Action is now being taken by AFLC to introduce MIL-H-83282 hydraulic fluid into the Air Force inventory (with emphasis on priority introduction to the F-4 aircraft at the earliest possible date). Production facilities and Air Force priorities will have to be established in order to phase in the new hydraulic fluid. Hydraulic system specifications and federal stock numbers must be rewritten and assigned before Air Force requirements can be fulfilled. It will take time, but an end to catastrophic hydraulic fluid fires is in sight. ★

	MIL-H-83282 New	MIL-H-5606B Old	Commercial Hyd Fluid
Flash Point	400° F	200°F	360°F
Fire Point	475°	225°	470°
Auto Ignition	650°	437°	1000-1200°
System Compatibility	Yes	Yes	No
Hi Temp Limits	*425°	275°	275°
Lo Temp Limits	-45°	-65°	-65°

*Pump test just completed



NIGHT FLYING OPERATIONS

How long has it been since you, the commander, the ops officer, maintenance officer, the fly safety officer, or supervisor, took a good hard look at your night flying operation? Here's what one alert supervisor found. He's taking steps to correct his deficiencies. Do you have problems like this? Would you know it if you did?

Night flight line safety surveys conducted during recent weeks have revealed a serious, almost flagrant disregard for common sense safety precautions. Lack of adequate FOD control, speeding near parked aircraft and on flight line, driving under aircraft wings, non-use of technical data, and maintenance with no lighting or inadequate lighting are becoming the rule rather than the exception.

FOD control, for example, is one of the most serious problems we are encountering. Yet, we continue to find replacement parts, tools, and safety pins for aircraft left lying loose under wings, in front of aircraft, and blowing down the line during windy periods.

We are all aware that night hours are also the critical safety hazard hours, yet it seems that our safety conscience sinks into the west with the setting sun. The prevalent attitude seems to be, "We can get the job done now that it is dark, because we can do away with that damn checklist," or, "I don't need to chock my vehicle because it's dark now and nobody will catch me anyhow." This is an attitude that we not only can, but we must, do away with.

The protection of our resources *is everyone's responsibility,* and each individual must pull his share of the load if we are to reverse this alarming trend during night operations. ★

Ops

TOUCHE

MAJ EDWARD FRANCIS, CF
Directorate of Aerospace Safety

The T-bird taxied into a fuel truck! Minor damage only, this time, but if they'd bumped a little harder you could have seen it from orbit. (Fortunately, there wasn't enough $1/2MV^2$ to set the whole thing off.)

Just because it was a little one instead of something that lit up the sky doesn't mean we shouldn't review the action with a critical eye toward keeping ourselves out of this kind of really bad trouble.

Let's see what happened—

The T-bird had just landed at home base and turned off the runway at a perpendicular taxiway which intersected a parallel taxiway in a civilian aircraft parking area. The parallel taxiway, 50 feet wide, was marked by a centerline stripe, but its boundaries were not defined in the ramp area. A civilian aircraft was improperly parked on the ramp, close to the taxiway, and was being refueled there because an attempt to move it to a more suitable location had been abandoned when the engine would not start. It was daylight and visibility was unrestricted. With the red and white painted fuel truck on the side of the taxiway, the stage was set.

As he entered the ramp area, turning left onto the parallel taxiway, the pilot was completing his after landing check and was following the yellow taxi line. He did not realize the fuel truck was on the taxiway until the last moment. In the collision the bottom of the right tip tank and the top of the truck's left front fender were dented.

Two contributing causes were identified in this case —the fuel truck improperly parked on a portion of the active taxiway, and the lack of clearly defined taxiway boundaries. However, the primary cause was the pilot's failure to exercise due caution while taxiing in a congested area.

This incident emphasizes once again that a congested area is no place to be doing checks on the move.

One other thing. What was the copilot doing at the time?

PULL CHECK?

Another T-Bird was the target for intercept training with an F-4. After the third intercept, the T-Bird started a 2-3G left descending turn at 300 knots. Suddenly the aircraft shuddered, as though it had passed through jet wash. The pilot had no reason to believe jet wash was present, so he slowed the aircraft to 180 knots and returned it to level flight. In level flight the aircraft continued to vibrate as though the speed brakes were extended, and the F-4 was vectored to the T-33 for a visual check.

The right half of the plenum chamber access door had come off in flight and had struck the vertical stabilizer, damaging the fillet, bending the elevator pushrod assembly and breaking out the rotating beacon and fuselage light. The pilot of the T-Bird made a controllability check at altitude, determined the airplane to be safe to land, and accomplished the landing without further difficulty.

The crew chief stated that he had fastened the door after his preflight, and the pilot stated that he had checked the door by pulling on it. However, only three of the fasteners on the right side showed evidence of being pulled out. Further investigation of other T-33 aircraft disclosed that these fasteners were not all aligned with the edge of the door and did not give a good visual reference for checking security of the door. The investigators also learned that two secured fasteners are sufficient to hold the door for a "pull check."

This unit has repaired all its aircraft so that fasteners are aligned properly, and alignment stripes have been painted on all the T-33 plenum chamber doors. Other units might take note.

This problem is older than many of your maintenance troops. How good is your safety education program down on the flight line?— RO*

*B/G Robin Olds

topics

FOG DISPERSAL

The FAA has awarded a large chemical company a two-phase contract to study the effectiveness of certain ecologically safe chemicals, known as polyhydrics, to disperse warm fog. The first phase of the contract will be part of the U.S. Naval Weapons Center "Project Foggy Cloud IV." It will involve spraying small quantities of the chemicals from a manned balloon and measuring the fog dispersal. If the Phase I tests are successful, the second phase will be conducted from April 1972 through January 1973. A final report should be available by summer of 1973.

RUNWAY DEBRIS

The National Transportation Safety Board recently released its final report on the fatal crash of a commercial airliner last year. According to the Safety Board, the probable cause was ". . . a loss of pitch control caused by the entrapment of a pointed asphalt-covered object between the leading edge of the right elevator and the right horizontal spar web access door in the aft part of the stabilizer."

The Safety Board pointed out that the introduction of jumbo jets, with more than twice the thrust of previous models, has caused considerable erosion along taxiways and runways used by the jumbo jets. At the airport in question, such pieces of asphaltic material were continuously being blown onto taxiways, ramps and runways, even though these areas were conscientiously being swept.

The message seems very clear. Those bases which are now accommodating the C-5 should intensify their runway debris control efforts. It's a lot cheaper and easier to pick it up *before* the accident.

FLIP CHANGES

High Density Traffic Airports:

FAA is extending for one year the special air traffic rule for High Density Traffic Airports which was scheduled to expire on 25 Oct 71. (See Section II Planning for OPERATIONS RESERVATIONS FOR HIGH DENSITY TRAFFIC AIRPORTS.) Reservation requirements for operation into and out of Kennedy International Airport, and O'Hare International Airport have been modified and are now required between the hours of 3:00 p.m. to 8:00 p.m. (local time). La Guardia Airport, and Washington National Airport require reservations between the hours of 6:00 a.m. to midnight (local time).

LOOK, SEE AND AVOID

"We were flying a Buzzard One departure out of Last Chance AFB. Published instructions are to maintain runway heading to the five mile DME, right turn to 060 to intercept the 038 degree radial. At the five mile DME and climbing through about 5500 feet, we began our right turn. Last Chance Departure Control cleared us to Center, followed immediately with '381, if you're still on frequency, be advised there is traffic at twelve o'clock.' We looked up in time to see a light aircraft passing by us less than 500 feet away. Weather at the time was VFR."

—extracted from aircraft commander's statement.

What can we say? The quote is from a routine message, a USAF hazard report on a near miss by a C-141. Two phrases leaped out and hit us in the eye: "We looked up . . ." and "Weather . . . was VFR." It may be heresy to suggest, but it seems clear that the precision, the cross-check and the attention to flight instruments required for safe flight in weather, are our worst enemies in visual conditions. When the weather is "VFR" the little airplanes are out flying in it. It is imperative that we *look, see* and *avoid!*

Ops topics *CONTINUED*

THROW A NICKEL ON THE DRUM—

An hour or so after takeoff, the pilot of the F-4 started a right turn and found the control stick wouldn't move to the right. Using aileron trim and rudder, the pilot completed his right turn, declared an emergency and diverted from flight plan to a nearby airfield. Enroute, the problem cleared up and he made an uneventful emergency landing.

Investigators turned up a nickel in the front cockpit between the torque tube stop bolt and the torque tube mount bolt. The nickel showed signs of being jammed between the bolts. They removed the nickel, checked the flight control system, found the system to be satisfactory and released the bird for flight.

Now, a nickel's not worth much—when it's a nickel. But when it's a piece of FOD it's worth a bunch—in terms of the damage it can cause. Everybody—pilots and maintenance types alike—should be aware of the necessity of accounting for tools and personal property while in the vicinity of aircraft.

Commanders: This is the very reason that cockpit FOD is a Red Cross item. Are you positive your maintenance and aircrew people are fully aware of the potential hazard?—

—AND NO ACM ORDERS

As the T-41 student was recovering from a power-on stall, a green, 18-inch snake slithered from the upper right air conditioning vent to avoid the cold and took up residence in the warmth of the IP's lap. A complete survey of type and size of snake was accomplished in approximately .01 second. The IP and student formed a committee of two to apprehend and confine the snake as it was in violation of current directives (not on flying status, not manifested, not medically cleared, no dog tags, and not enrolled in a formal training course). Subject snake was captured and confined to a sick sack for the remainder of the flight. Upon return to the flight room, subject snake was chastised for his willful violation of flying regulations and utter disregard for safety of flight. Damage to the aircraft was confined to minor seat cushion deformity.

Ingenuity has changed many would-be accidents into good war stories. Looks like that ingenuity is still with us, when the opportunity arises.

—ATC Safety Kit

TESTING AND LEARNING

. . . from VEHICLES OF THE AIR by Victor Lougheed (published November 1909).

"In testing new flying machines, and even in learning to operate ones of established qualities, there are a number of things to be considered that are a little different from the conditions surrounding the tests of other mechanisms and the operation of other vehicles.

"Thus failure of an experiment with a mechanism of this type is likely to be not a mere mechanical failure, but also may readily result in injury to or the death of its operator unless ingenious and well-considered precautions are taken to assure a maximum prospect of safety.

"Likewise, for a beginner to attempt to drive a machine even of a type known to be well capable of flying, the attempt can easily become most dangerous business if gone at in a reckless manner."

(How terribly, terribly prophetic, Mr. Lougheed!)

SOUR PICKLE

The OV-10 pilot had expended all his Willy-Pete rockets from station two, and thought he positioned the number two switch to OFF after his last marking pass. Then, intending to select number four station for additional passes, he inadvertently selected number three instead. He realized his error and, after returning number three to what he thought was the OFF position, he switched number four to the FIRE position. On his next pass, when he pressed the trigger button, a rocket fired from station four, just as he wanted it to. Unfortunately, he also jettisoned the centerline tank (connected to station three) and the LAU-68 rocket pod from station two. At this time the pilot realized he had positioned switches two and three to DROP, rather than OFF.

As a result, the unit has decreed that all pilots will arm or safe the weapons control panel using only one finger. Since a positive lifting movement is required to move the switch past the OFF detent into the DROP position, it sounds like a good idea. This unit has implemented the procedure into its phase one checkout program and instructed its Stan Eval pilots to monitor compliance. Units of other aircraft with similar panels (and similar problems) might give some consideration to the idea. ★



Toots

is interested in your problems. She spends her time researching questions about Tech Orders and directives. Write her c/o Editor (IGDSEA), Dep IG for Insp & Safety, Norton AFB CA 92409

Dear Toots

I have a question regarding TO 00-20-5, dated 1 September 1971, and the proper signature to use in signing off the "In-Process Inspection" entry in the Corrective Action block of the 781A.

TO 00-20-1, para 6-61, says in part that the minimum signature to be used on the maintenance forms will be "the written first name initial, last name and grade/rank, although a full signature should not be considered in error." However, the current 00-20-5, para 2-94, says that a statement such as "In-Process Insp Accomplished" will be entered in the Corrective Action block of the 781A, if required, followed by "first name, initial, last name and grade/rank."

I believe that a typographical error was made and that the comma between name and initial should not have been inserted. However, our QC people have interpreted the statement to mean first name, middle initial, last name and grade/rank.

While an AFTO Form 22 is being submitted, all entries made after 1 November 1971, not having the full signature will be considered in error. Can you clarify?

MSgt Richard K. Bailey
89 CAMRON
Andrews AFB, Maryland

Dear Richard

I talked with the OPR for 00-20-5 and you are correct. There is a typographical error. The intention was to require the same old minimum signature—first name initial and last name. The OPR is expecting your AFTO Form 22 and will give it immediate attention.

Keep up the good work.

Toots

Dear Toots

I am at odds with my brother Quality Control inspectors about the intent and applicability of paragraph 4-36, TO 00-25-172 (page 4-9, Change 10). The paragraph states: "Adequate eye protection (safety glasses or face shield) will be worn by persons servicing aircraft or equipment with nitrogen gas." I feel that this sentence pertains to servicing of systems and equipment with *high* pressure N_2. My counterparts maintain that eye protection must be worn regardless of the pressure.

It seems very senseless to require a face shield or safety glasses to perform the following tasks:

a. Purging and pressurizing a battery case to 10 psi.

b. Servicing and pressurizing a hydraulic reservoir to 50 psi.

c. Checking and pressurizing a tire to 100 psi.

d. Purging a liquid nitrogen system with gaseous N_2 at 35 psi.

My question is in two parts: One—is my contention valid? Two—if you do agree with me, at what servicing pressure should eye protection be required; 500—1000—1500—2000—3000 psi, etc?

Please do not get the impression that I do not have respect for high pressure gas—I do! But I feel that compliance with this paragraph is too restrictive and that it should be applied with common sense.

MSgt James L. Watts
9 SRWg
Beale AFB, Calif.

Dear Jim

I must agree with your brother Quality Control inspectors. My interpretation of 00-25-172, para 4-36, requires the use of eye protection during all nitrogen servicing. This paragraph does not define a specific pressure.

I think a bit of additional information for you is in order. Take a look at AFM 127-101, para 7-4, which defines pressure systems, and para 8-2.0 which describes the dangers of handling pressurized gases. Pressures as low as 10 to 15 psi have been known to cause serious injuries.

Toots

FOR MAINTENANCE SUPERVISORS

MAJ RICHARD E. HAMILTON, Directorate of Aerospace Safety

Many of the problems that plague the F-4 today have been identified for years . . . yes, I said years. Corrective actions, for the most part, have been to further refine the technical data in order to identify the problem before it happens. We then call for a one-time inspection of the fleet, find a considerable number of failures, chaffing, etc., and then turn the whole problem over to the crew chief again.

Just because we publish more explicit inspection criteria, we seem to expect a young troop just out of tech school to solve everything. Let's face it, a man just can't be taught all of the tricks of the trade at tech school. Is it necessary to have years of experience in order to spot a peculiar bend in a wire bundle, or to know that this particular fuel line needs to flex more than an inch when the engine is running? Just what does "adequate clearance" mean in the real world of field maintenance? OJT is a lot more than "reading the cards."

The key is supervision, or maybe I should say instruction. Experience comes from both sides, and the new man needs to know the results of his efforts, both good and bad . . . "Spotting a chaffed line here can prevent an inflight fire;" "If this wire bundle shorts out, the engine can flame out;" "Check this cable clear through both bulkheads or binding can occur and the pilot will lose control of the throttles."

A top notch supervisor will insure that his guys are qualified in both inspection and prevention.

Tech TOPICS

BRIEFS FOR MAINTENANCE TECHS

LOST AND NOT FOUND

During through-flight inspection of a C-141, a 4' X 1' inspection panel just forward of the rudder was found missing. A search at both the departure and recovery bases failed to turn up the missing panel. The panel is normally secured by 52 screws, three of which were still attached. The remainder of the nut plates were intact, indicating that the panel had not been properly installed during maintenance.

Aircraft panels were designed to enable maintenance personnel to inspect and service something beneath the aircraft skin. It makes sense for the supervisor to inspect the security of panel as well as the work performed below it.

AIRBORNE ALLIGATOR (CLAMP)

After takeoff the T-39 gear indications failed to show up-and-locked. The pilot recycled the gear four times but this failed to correct the problem. The gear was returned to the down position with three in the green, and a safe landing made.

An alligator clamp minus the wire was found attached to the nose gear door forward arm. The clamp had wedged between the nose gear door and forward fuselage, preventing the door from fully closing. Apparently the clamp was not removed after refueling.

POL and maintenance troops note: TOs 00-25-212 SS-1 and 1T-39A-2-1, para 4-7A spell out the type static ground required during refueling.

Wonder how the pilots missed this on preflight?—Ed.

THE TO, SARGE

Two sergeants were dispatched to perform a flow check on the F-4's emergency canopy system. Even though the TO was on hand, the sergeants goofed and blew the sequence actuator.

While performing step E of TO 1F-4C-3-2 (which states: "disconnect line 7 from T fitting 9"), the sergeants inadvertently disconnected line 7 from T fitting 6. Not realizing their error, they continued with steps F through L, which require that dry air be applied. At this time the sequence actuator blew.

The primary cause was personnel error, in that the sergeant disconnected the wrong line. A contributing cause was that the crew chief didn't use the TO as a checklist while his team member performed the work.

TO utilization is a must during all maintenance.

M & M

That M & M stands for Maintenance and Murphy. Here's why we chose that title.

After the utility hydraulic system in a T-38 failed in flight, the utility pressure and return lines to the left horizontal tail actuator were found to be connected in reverse. High pressure through the utility return line into the servo valve caused failure of the seals separating the flight control and utility system. This allowed utility fluid to pass into the flight control system where the excess fluid was vented overboard leading to utility system fluid depletion and system failure.

Maintenance bought the blame, but it looks like Murphy also had a hand in this one. Your TO was designed to eliminate Murphy—Use it!

T-38 TORQUE TALE

During takeoff roll for an FCF after Nr 1 engine change, there was an explosion and the left engine fire warning light came on. The takeoff was aborted, but there were two more explosions and the right engine fire warning illuminated. Both engines were shut down and the crew smartly exited the burning aircraft. The fire, in the engine bay and tail section, was quickly extinguished.

There were several things wrong with this bird:

- The two top nuts that mount the fuel control to the pump had not been torqued during installation, and the washers were missing.
- There was a small gap between the fuel control and pump and about a one-eighth inch gap between the nuts and flange. At approximately 25 psi test cell boost pressure, leakage would occur between the pump and main fuel control.
- The O ring seal had been crimped during installation and ruptured because of the loose connection.

In this particular case, three people failed to do their jobs: the mechanic who did the work, the dock (station) supervisor and the QC inspector who finally cleared the work performed.

COMMANDERS TAKE NOTE: Are there problems being documented by your QC that aren't getting to you? Are you following up on the problems you and your staff have corrected? Could an instance like this one happen in YOUR shop??—

IT COULD BE ONE OF YOURS

SAAMA has received reports from the field which reveal a serious problem concerning ejection seat ballistic hoses. In an inspection of 40 F-102 aircraft and five T-33s, 92 hoses were found with tolerances that failed to meet TO (42E1-1-1) requirements.

These hoses are a field-level manufacture item, and it's obvious that quality control procedures for their manufacture have not been adequate. If the couplings do not match properly, it is likely that over torquing will result from attempting to tighten the couplings. The hazard is obvious: improper mating of the couplings can cause a loss of gas pressure and render the escape system useless!

A Dash-2 handbook operational supplement has been issued on these two aircraft to assure close inspections at time of maintenance. Even though reports have only been received on the T-33 and F-102, it does not mean this problem is unique to these aircraft. It is highly probable that escape systems in other aircraft are also involved, since many use the same type of locally manufactured hose.

Good quality control procedures are absolutely essential during the manufacture, installation and maintenance of these hoses. This potential hazard warrants the immediate attention of ALL personnel involved in egress system maintenance.

PAPER TIGER

The pilot of the TH-1F brought the aircraft to a four-foot hover, then hover-taxied approximately 50 feet forward. At this time the pilot heard two loud bangs but

before he could react, the aircraft yawed left and struck the ground on both skids. The engine was shut down and the crew evacuated.

Engine teardown revealed particles of brown paper towel in the inlet guide vanes and compressor section. The engine was cleaned and reassembled, after which it operated normally.

A specific source for the towel was not found; however, it was determined that these towels were being used at the mobile snack trucks and in the latrines adjacent to the flightline.

Regardless of the nature of foreign material, pick it up and properly dispose of it, or it may turn up in a critical area, as the paper towel did in this incident.



A REASON FOR THOSE FORMS

This F-4 was on an FCF for a Nr 1 engine change. After the crew entered the supersonic corridor and accelerated to 1.8 mach, they heard a loud thump and the aircraft felt as if the speed brakes had been extended.

A visual inspection by a chase aircraft confirmed that door 82L (a left hand engine access door) was missing. After a controllability check, landing was accomplished without further incident. The door loss was traced back to the night before when an engine crew had dropped the door to make final linkage adjustments on the trim pad. Upon completion of the adjustments and trim run, only the camlock fasteners were secured. The mount bolts were not installed, nor was the appropriate red X entry made in the aircraft forms.

The following morning the crew chief failed to detect the missing mount bolts during the preflight inspection.

The Aircraft Record (AF Form 781) has definite purposes, one of which is to record uncompleted maintenance. Had the appropriate form entries been made this incident would have been avoided.

MAKESHIFT MAKES TROUBLE

The T-37 was taxied to the pad for Nr 1 engine trim. The NCOIC of the trim pad installed the communication, Jet Cal, and EGT cables.

The primary electrical cable group was inoperative, so a secondary cable grouping was used. These cables did not have the required securing device attached, so the NCOIC routed the cable from the electrical box around the front of the aircraft, across the right canopy rail and into the cockpit.

The Nr 1 engine trim was accomplished, and the NCOIC and his assistant went into the trim shack to complete the forms.

At this time the crew chief, who was in the cockpit, requested permission to start Nr 2 engine. Permission was granted and Nr 2 was started. Just after it reached idle RPM the crew chief saw the electrical cables pull toward Nr 2 intake. The fire warning light came on followed by smoke in the cockpit. The engine was immediately shut down.

You guessed it—engine FOD. The cause: (1) The electrical cables had not been properly secured; (2) the crew chief did not clear the Nr 2 area prior to start. To add to the above, the crew chief started the engine without the required fire guard posted.

WIRE FOR SAFETY

Proper securing of aircraft hardware during maintenance is essential. That little 15 cent nut can turn into a million dollar accident if it's not properly installed.

Insufficient torque can lead to that little item not staying where it was intended to stay. Too much torque can lead to a premature failure from stress.

The same applies to safety wire: The correct size wire for a specific item is a must. Here is an example of what can occur when the wrong size safety wire is used.

A T-37 was on downwind. The pilot placed the gear handle down, but only the nose wheel indicated down and locked, and the hydraulic pressure went to zero.

The pilot initiated a go around and activated the emergency extension system. The right main showed down and locked but the left main stayed up. After all attempts failed to lower the gear, the runway was foamed. The pilot touched down on the right main and nose and held the left wing up as long as possible. The aircraft came to rest 6000 feet down the runway with approximately $1600 worth of damage.

The wrong size wire had been used to safety the gear actuator gland nut. The wire broke allowing the nut to back off causing subsequent system failure.

Tech TOPICS

AIM-7 WING LOSSES

CAPT JOHN C. VETEIKIS
Directorate of Aerospace Safety

In a tale from Norse mythology, it seems that one Wayland, a smith, whose trade was manufacturing weapons, also constructed wings to be attached to the body. According to the saga, Wayland, after finishing his first set of wings, planned with his brother Egil, to try them out, i.e., Egil was to make a test flight. The flight went well until a landing was attempted whereupon Egil discovered that the wings which worked on takeoff did not work on landing. Unfortunately, the tale doesn't relate whether Wayland, the designer, or Egil, the user, was at fault.

History repeats itself, and once again we have wing problems—this time AIM-7 missile wing losses. Supposedly, we have come a long way from those days of mythological tales, but a look at the facts makes one wonder. In mid-1970, a GO-NO-GO gage was devised that, if used properly, would prevent AIM-7 wing losses. However, the number of wing losses has remained constant, and most of these incidents have been attributed to personnel error on the part of the user. Some bases have been three and four time repeat offenders.

The loss of missile wings is not a myth. The descendants of Egil are loading our missiles, and steps must be taken to insure that they have this gage and are using it properly. ★

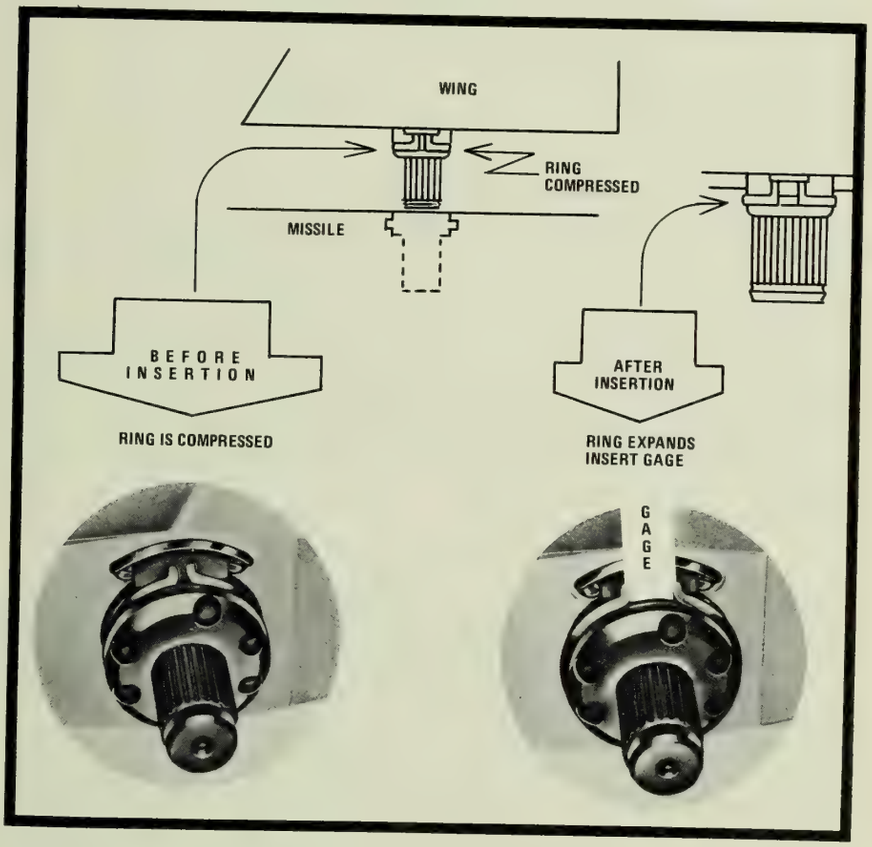
QC, WHERE ARE YOU?

Following a TACAN penetration and GCA pickup, power on the F-4 was advanced to 94 percent to maintain 250 kts. When the student retarded the throttles to obtain final approach speed, the number one engine RPM remained at 94 percent. The instructor pilot attempted to control the engine RPM from the rear cockpit without success, so he shut the engine down by placing the throttle to idle cutoff, declared an emergency, and made a full stop landing.

The problem with engine control was evident once the engine bay was opened. The throttle torque shaft was disconnected. The bolt that secures the torque shaft to the fuel control crossover shaft had been improperly installed. The bolt shank had not engaged the spline shaft undercut of the fuel control crossover shaft during installation.

Review of the aircraft records indicated that the maintenance was last performed in this area during engine installation at the IRAN facility.

This kind of maintenance error can cause a disaster and is a good example of why we have inspectors. Where was the one who should have caught this goof?



EXPLOSIVES SAFETY

PEOPLE PROBLEMS WITH EGRESS SYSTEMS

An accident occurred when three men were removing an ejection seat. The system functioned as designed, and three men were injured. The suspected cause was failure to install maintenance safety pins!

The use of specially trained personnel (AFSC 422X2), specific instructions in each aircraft TO series, and checklists for the specific task performed will prevent an accident like this one. And if a task is peculiar to one system or base, include applicable MOI/SOPs on the list.

Each item requires specific safety precautions. However, two safety precautions that apply to all EGRESS CAD/PAD items are:

- All items not installed in aircraft must have the shipping safety pin and/or shipping plug or cap installed.
- Do not roll, tumble, or drop during handling.

Accident reports continue to show EGRESS near the top of the list of accidents, and personnel error as the main cause. The solution lies partially in training and education. How are your people trained? By whom? Have ALL of the personnel that might come in contact with the explosives components been included? Is a short safety briefing conducted prior to starting the job? These are some of the questions that must be answered to insure a complete safety program. AFM 66-1 states, "The chief of maintenance must provide (through training control) the means for determining training needs and the program for filling these needs." (This can be normal flight line training, including specialized training where problem areas exist.) "Maximum use must be made of FTD and MTD. ETS (Engineering and Technical Services, AFM 66-18) must be exploited in the overall training program."

TO 11-1-34 is one of the best publications for ready reference on the different types of explosives items used on aircraft. The Table of Contents lists about any explosive/egress device you can name, and includes identification data, concisely-worded descriptions and many illustrations. All egress personnel should have this and other appropriate TOs available for use.

(HQ 13th Air Force)

EXPLO 71! NEED TO IMPROVE

HY BOSCH, Directorate of Aerospace Safety

Virtually every technical order involving explosives contains the same canned statement, *"All personnel engaged directly or indirectly in operations which involve explosive items and/or other hazardous material shall be thoroughly trained in explosives safety . . ."* With this requirement, mustn't all egress system personnel be conscious of explosives safety?

Egress personnel know that technology has provided explosives devices that are safe to handle; technical orders provide them with tested procedures; and training has made them intimately familiar with their tasks.

But complacency can set in! Satisfied by their prowess, supervisors and workers tend to take shortcuts. The TO referred to less often and eventually abandoned. Some procedural steps are omitted and soon forgotten. Result—complacency terminates in an accident. Then it's back to fundamentals again.

Far fetched? Let the record speak for itself!

Of 35 egress mishaps in 1971, 34 were a result of personnel error. The 35th was due to supervisory omis-

sion. In 21 instances egress personnel were involved.

Safety pins were a recurring factor in these events. Twenty-two mishaps resulted from not installing pins, using unserviceable pins, improperly installing pins or inadvertently pulling the pins during maintenance or seat removal/installation.

Other mishaps occurred when connections were not made or were done incorrectly, while stowing equipment in the cockpit, or when too much force was used in conjunction with seat removal. One happened when a crew chief's clothing caught on the linkage assembly, firing the initiator.

Most disturbing were two mishaps where explosives devices had been activated—*but had not been reported or restored to operational condition!*

The only time to be complacent in egress maintenance is when the seat you maintained saves someone's life. That's satisfaction! ★

SOAP

LT COL JOHN M. FLAHERTY
Idaho ANG, Boise, Idaho

The first positive save has been credited to the 305 Spectrophotometer (SOAP Lab) since being placed into operation by the Idaho ANG at Boise in July 1971. Thanks to the "on base" oil analysis lab and the expertise of MSgt Bruce Carpender, an emergency landing was averted recently and possibly an F-102 saved. The story goes like this: In the 18 hours F-102 S/N 26 had flown since the last oil change, the wearmetal reading had not varied more than .5 parts per million. On the last sample, however, the iron jumped from 3.2 to 4 PPM, the copper from .6 to 2.6 PPM, and the magnesium from .8 to 4.5 PPM. Based on the last sample, Sergeant Carpender advised Maintenance Control that the aircraft should be grounded until further evaluation could be made. A decision was made to ground-run the engine for 30 minutes, after which another sample would be taken and evaluated. The engine had been ground-run for 10 minutes when oil started leaking from around the engine mounted gear box and it appeared to be extremely hot. Further investigation showed that the gear box had failed internally. At least two F-102 aircraft are known to have been lost in the past, due to inflight failure of the gear box. This incident points out several important facets of the SOAP program.

- The on-base SOAP Lab is a must for an effective program.
- If at all possible, samples should be taken after each flight and read before the aircraft flies again.
- The SOAP technician must be aware that the key to the program is not how high the reading is, but rather how abrupt the increase is. He must react quickly to ground an aircraft that shows a potential problem.
- No one system should be depended on to be the tell all. In this case, the magnetic plug should have provided the warning but it did not. In many other cases, the magnetic plug has provided the warning, while the SOAP reading was not significant. If accidents are to be avoided, all systems must be diligently used. The fact that occasionally one system might not tell us what we think it should, is not a valid reason for lack of confidence in that system. *ED. NOTE: The DOD proposal is to have analysis capability within 24 hour range of all installations.* ★



MAIL CALL

HOOKS VS BUTTONS

Safety requirements do not appear as a result of the acts of irresponsible people, nor because of subjective evaluations of once-in-a-lifetime incidents. Rather, requirements come into being when definite trends toward unsafe situations are observed. This is the reason for the adoption of coded shapes for critical controls throughout the cockpit. These shapes are instantly recognizable through feel, even while one is wearing gloves.

A good example is the wheel-shaped knob of the landing gear handle. In the dark, who could mistake it for anything but what it actually is? I mean what pilot, indoctrinated in the Air Force system, could feel it and mistakenly assume it to be anything else?

Other knobs and handles in the aircraft are shape coded for easy identification in low light—or no light conditions.

The reason for this article is the arresting hook control—shaped (of all things) like a hook. Just why it is shaped like a hook has been lost in antiquity, but at least it can't be mistaken for any other control in the cockpit (by a trained pilot, I must hasten to add or I lose this point). The broad end of the hook also lends itself to diagonal yellow and black striping to identify it as a "critical" control.

Can you imagine suddenly discovering on landing roll, that your brakes are out, the drag chute is missing, you've landed long, and must engage the barrier? Has the arresting hook control become a more important item to you? How much time can you spend feeling for it? And how can you identify it if the lights are out and it's DARK? Some pilots, particularly the ones who have experienced an emergency arrestment, will agree—the arresting hook does become a critical control under the above set of conditions. However, any one of the conditions above would be bad enough to make the hook control a critical control.

In view of the foregoing, it is somewhat unnerving to observe that several of our newer aircraft are equipped with arresting hooks which have a button for a control. Some of these aircraft have buttons which are only a few inches from the buttons of other critical controls. Can you imagine punching for an arresting hook, in the dark, with a condition like that staring you in the face?

Some people evaluating such a condition say—"what's wrong with that? The buttons are marked, who could mistake one for the other?"

Even some pilots who must fly these aircraft excuse the situation with, "I've never had any trouble activating the arresting hook on this aircraft." Gee, that's great—all our worries are over! I must mention that an F-100 (with a button type arresting hook control) caused an incident when the pilot couldn't find the button in the dark. How was this situation remedied? A post-light to illuminate the button. The perfect solution—until the bulb burns out or a power failure causes a forced and arrested landing.

At least one of our modern aircraft has the arresting hook control on the right side. This is a normal control for the Navy shipboard operation where the hook is lowered as a matter of course while the aircraft is still airborne. However, can you imagine changing hands on a control stick and grabbing for a handle at a critical time? But how many gripes do we hear? Just because an airplane is the best thing in the inventory doesn't automatically excuse it from having faults.

The point I'm trying to make is —"SAFETY MUST NOT BE COMPROMISED." A subjective evaluation of a safety hazard should not negate the experience and studies which have established safety procedures and safety items. When cockpit geometry becomes so messed up that the standard shapes for critical controls cannot be used or located correctly, it's time for some objection from you pilots in the field. Your comments, suggestions, and URs do create some waves which bring changes to undesirable conditions.

THEODORE C. STEWART
Crew Station Branch
ASD, WPAFB, Ohio

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UNITED STATES AIR FORCE

WELL DONE AWARD

Presented for outstanding airmanship and professional performance during a hazardous situation and for a significant contribution to the United States Air Force Accident Prevention Program.



Major
JAY M. STRAYER

40 Aerospace Rescue & Recovery Sqdn
Udorn, RTAFB, Thailand

During a night training flight on 5 May 1971, Major Strayer and his crew were conducting simulated night aircraft recoveries. In order to simulate the most realistic conditions for training, the HH-53C helicopter had to be hovered above 30 to 100 foot trees in a blacked out configuration. During one such approach to a 200 foot hover, with the other pilot at the controls, a loud explosive-type sound was heard in the number two engine. The engine lost power immediately and the aircraft began to settle toward the trees.

Major Strayer took control of the aircraft and called off the bold face items on the engine failure checklist. The throttle on the remaining engine was already set at maximum for the approach, but fuel had to be dumped to prevent further settling. Major Strayer called for the external auxiliary fuel tanks to be jettisoned, but only one of the fuel tanks jettisoned, leaving the gross weight at 33,500 pounds. In this configuration, aircraft settling was finally stopped on the tops of 30 foot trees; however, the problem of the surrounding 100 foot trees still had to be surmounted. Using his professional skill and all the power available from the remaining engine, Major Strayer obtained translational lift and guided the helicopter around the 100 foot trees in his flight path. During the one minute the aircraft spent in this hazardous environment, rotor RPM dropped to 84 percent and the number one engine exceeded temperature limitations. Major Strayer subsequently declared an emergency and a successful single engine approach and landing were accomplished at home station. WELL DONE! ★

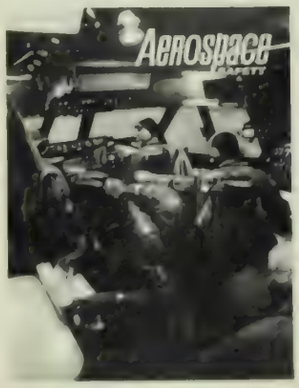
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DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

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FEBRUARY 1972 AFRP 127-2 VOLUME 28 NUMBER 2

whoa woes

One sure way to cause the hair to stand up on the back of your neck is to apply your brakes and have your machine pick up speed. Here are some guidelines that may help avoid this nasty situation.

LT COL DAVID L. ELLIOTT
Directorate of Aerospace Safety

After "surfing" 1300 feet, the aircraft slid off the side of the runway and into a major accident. Another victim of the phenomenon known as hydroplaning.

It was a rainy night, the water depth was estimated to be one-tenth of an inch. The tire tread was measured at nine hundredths of an inch on one main gear tire and none on the other; the total dynamic hydroplaning speed was computed at 114 knots. The aircraft touched down at 135 knots, 16 to 18 feet left of the runway centerline. The crosswind component was computed at approximately 13 knots. It was calculated that the aircraft departed the runway six seconds after touchdown. With this data it's easy to see—the 13 knots represents 22 feet/sec which, times six seconds, equals 132 feet, precisely his distance from the edge of the runway at touchdown.

It has been said by the people who know, that, under total dynamic hydroplaning conditions, an aircraft can be expected to depart the side of the runway at a rate equal to the existing crosswind component.

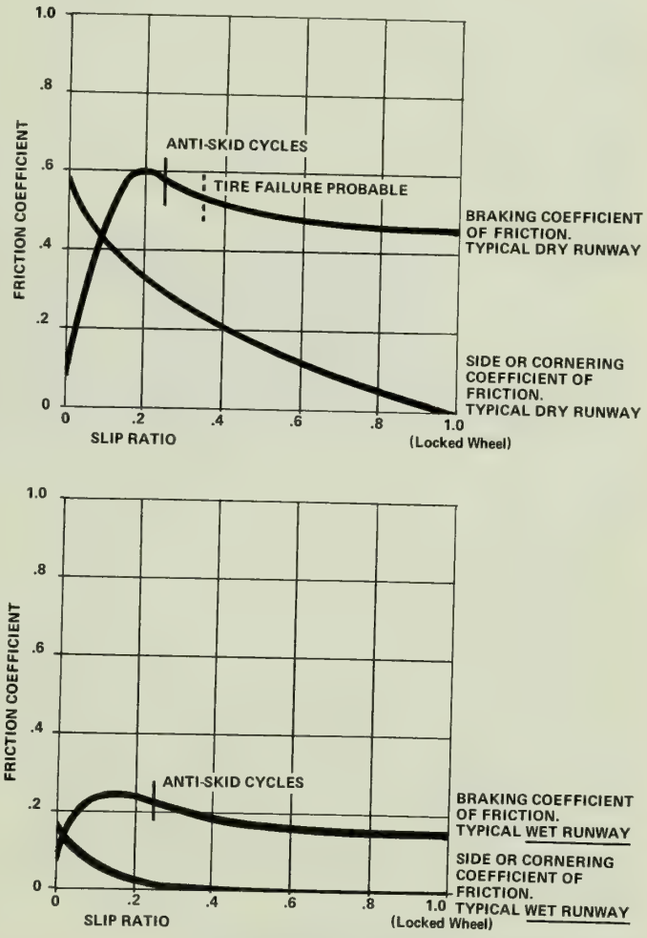
Most pilots agree that controlling and stopping aircraft on dry runways is not much of a problem, but when the runway is wet, or icy, or flooded, it's a different ball game.

On a dry surface an aircraft can develop friction values that exceed the structural limits of the tires. When an aircraft tire is totally skidded (slip ratio of 1) on a dry surface, tire failure is complete and immediate. Figure 1 shows that, as you increase the slip ratio, the side force capability of the tire drops, and as you reach a 1.0 slip ratio (total skid) the side force coefficient of friction drops to zero, whereas the braking coefficient of friction levels at somewhere around 0.4. You've probably experienced this phenomenon of loss of directional control during a panic wheels-locked stop in your automobile.

Anti-skid braking systems are designed to prevent total skidding and thus loss of directional control and tire failure. Some very slight skidding is required, however, to develop the most effective coefficient of friction. From Figure 1 you can see that the coefficient changes as the slip ratio changes. The most effective frictional values are developed with approximately 0.20 slip ratio or 20 percent of a total skid. Based on this, most anti-skid systems cycle at 0.15 to 0.25 slip ratios.

Most jet fighters are not capable of developing really high coefficients of friction on dry runways, even

FIGURE 1



though full skids are possible, particularly with boosted brake systems. The author believes that, on a dry runway, failure of the tire will generally occur prior to development of a 100 percent slip, particularly with high pressure tires.

To better understand the effects of a wet runway on stopping distances and aircraft control, let's look at how a pneumatic tire develops friction on a dry surface. Researchers in tire characteristics say there are two sources of friction between the tire and the runway surface. They are *adhesion* and *hysteresis*. Where the tire contacts the runway surface high pressures exist, and strong molecular forces can be generated to resist the relative displacement of the surfaces. These adhesion forces resist skidding.

Rubber has the ability to conform to the shape of the irregularities in the runway surface. The horizontal components of these potential forces constitute the friction due to *hysteresis*. If a runway is smooth, such as a smooth glass plate, friction due to hysteresis becomes negligible. If a runway is lubricated with water or oil the adhesion forces become negligible. One of these two sources of friction is necessary. On wet runways the hysteresis component is the only practical source of friction available. However, enough vertical pressure must be exerted to permit the tire to break through the lubrication film and conform to the irregularities of the runway surface.

It is important then that runway surfaces have texture and that the irregularities in the surface be capable of developing horizontal component forces. Grooved runways do this. Runways with the aggregate worn down to polished stones may not provide horizontal component forces, even though texture is present.

HYDROPLANING

Hydroplaning is an abstract term, widely misused, and more widely misunderstood. Let's define it specifically.

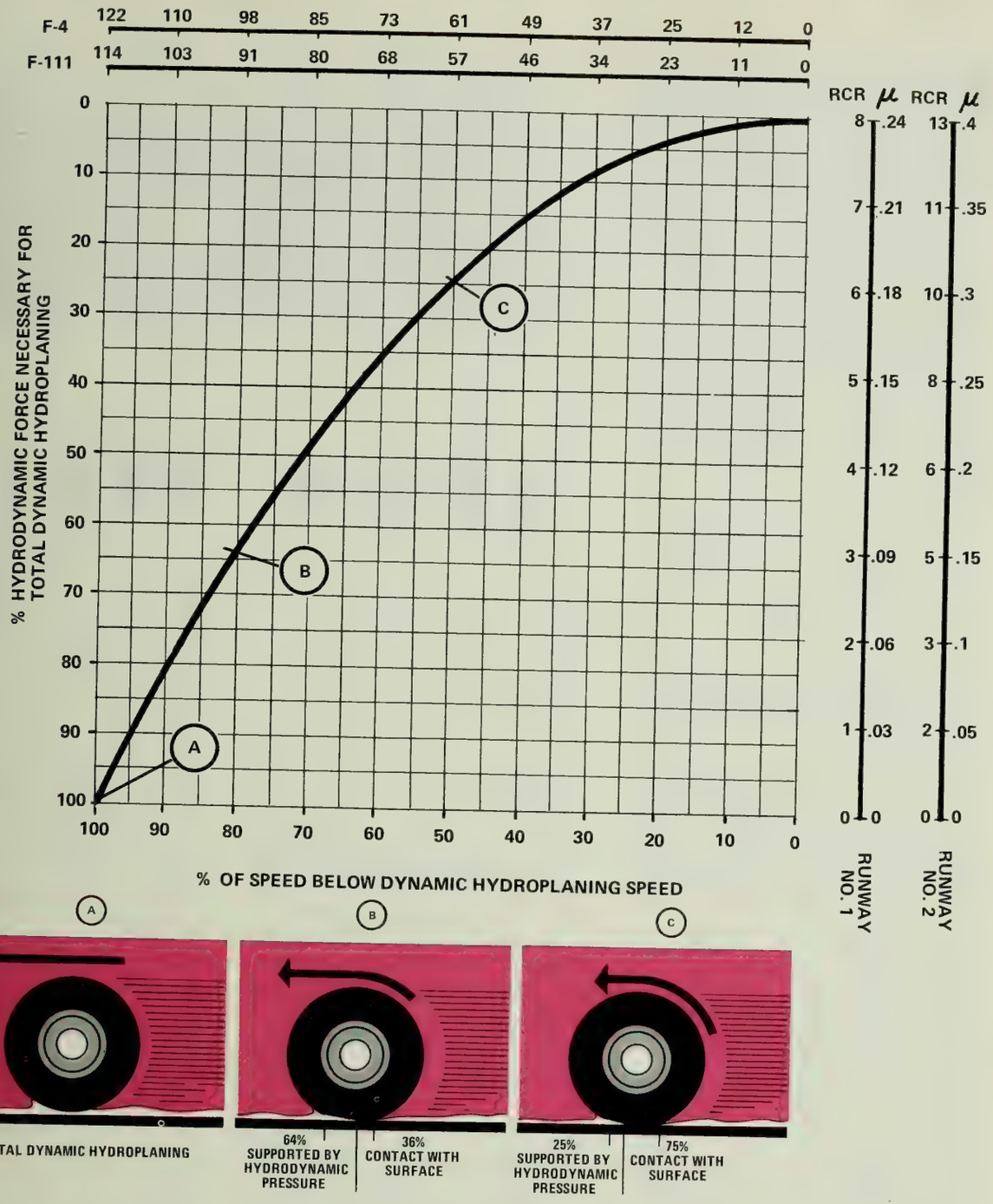
Total dynamic hydroplaning is a phenomenon that occurs when the water is deep enough, and the speed of the aircraft great enough, to create a hydrodynamic pressure that reaches the tire footprint pressure. The tires are lifted from the runway surface, the frictional values between the tire and runway are not enough to spin up the tire, so it can be said that the coefficient of friction is less than that of a free rolling wheel. Application of wheel brakes under these conditions is about as effective in stopping the aircraft as applying wheel brakes on the downwind leg to get spacing in the pattern. This condition can be calculated by the formula $9\sqrt{\text{tire pressure}}$ = hydroplaning speed in knots. Now, if you are under the impression that $8.9\sqrt{\text{tire pressure}}$ = non-hydroplaning speed in knots, best read on . . .

Wet runways vary extensively in relative slipperiness. Both Projects *Combat Traction* and *Concrete Traction* demonstrated that with uniform water depths the coefficients of friction of various runway surfaces differ significantly. One runway tested developed a coefficient of friction of only .24 when wet, while others developed up to .6. The significant point is that partial dynamic hydroplaning is dependent upon the runway surface below the water and the amount of hydrodynamic force available. If the runway surface is smooth and you slow to below total dynamic hydroplaning speed, you're still in trouble, partially because the runway is smooth and partially because you still have a slight case of dynamic hydroplaning. When you cease to *totally* hydroplane you *partially* hydroplane, depending on the hydrodynamic force on the tire. This force is a function of the square of the speed of the aircraft or wheel and tire.

Figure 2 explains the effect of partial hydroplaning on braking performance on a slippery wet runway. Across the bottom of the chart is the percentage of speed below total dynamic hydroplaning speed. Across the top are the corresponding speeds of the F-4 and the F-111. In the F-4 your total hydroplaning speed is 122. At 92 knots you would be 56 percent hydroplaning. Move to the right side of the chart to runway 1 with a total coefficient of friction capability, when wet, of 0.24 (or an RCR of 8). Under the partial dynamic hydroplaning condition above, the total coefficient of friction capability at that speed would be only 0.10, (an RCR of 3). As the aircraft slows down, the effective RCR or coefficient of friction would increase but never exceed the total capability of the runway, which in this case is 0.24 (RCR of 8).

Viscous skidding and reverted rubber. Viscous skidding is not, in the true sense, hydroplaning. It's a condition that exists when the surface is lubricated and the adhesion forces are significantly reduced. Skidding starts at lower brake pressures or coefficients of friction. If the runway is relatively smooth, the heat generated from the skidding tire can cause the rubber to revert to the uncured state. The heat necessary to do this is on the order of 600 to 700 F and rapidly produces steam from the water film which can generate pressures that reach the footprint pressure. This is referred to as friction-generated, reverted rubber hydroplaning.

This phenomenon does not occur under a total dynamic hydroplaning condition, but may under partial dynamic hydroplaning. It usually occurs when there is a thin film of water on a smooth runway surface. The



IGURE 2

real significance of this type hydroplaning is that it is not a function of speed, and the condition can exist down to very low velocities. Other than the fact that a fairly smooth runway is necessary for this to occur, it is unpredictable. One interesting point about this phenomenon is that it can and has occurred on unbraked nose wheels during sideslips.

MEASURING SLIPPERINESS

There are several methods of measuring relative slipperiness of runways. The only system presently in use operationally for measuring the slipperiness of wet runways is the British designed Mu-meter used by the United Kingdom. USAF, in conjunction with FAA

continued on page 27

MANAGEMENT IN ACTION

show ME!

Frequently deficiencies go undetected for long periods simply because those who could, and should, correct the problem can't see it—a case of not seeing the forest for the trees.

This is not an uncommon condition. Maintenance people, for instance, are usually 100 percent occupied with their day-to-day workload and may, consequently, live with some unacceptable situations, such as unsafe AGE, poor PMEL support, a third-rate motor pool, supply problems, just to name a few.

When they can't hack the schedule, because some birds are out of commission, the Ops types blame the maintainers regardless of the reason.

The wing commander begins to get excuses rather than performance, and the whole house of cards starts to quiver.

When an outfit gets in this condition, an IG inspection can be devastating in its criticism of local management; but, at the same time, it could be the salvation of the unit.

A commander commands. He also manages, and the two words are not necessarily synonymous. Therefore, in his elation at getting a command, a new commander must reflect on the management aspects of his job. Perhaps the following samples of findings from Unit Effectiveness Inspections conducted during the past several months will serve to stimulate and motivate both new and experienced managers at all levels. Items cover several different areas and are from UEIs at a half-a-dozen different bases.

• No approved listing of authorized items to be packed in survival kits to be placed aboard aircraft . . . neither the radio tester nor battery tester had been calibrated since factory release in 1967 . . . survival radios and beacons were not being tested every 120 days . . . several items of test equipment were on order but not on hand . . . no one was on orders as authorized to inspect and repack parachutes, etc., etc., etc.

If a UEI team were to inspect your PE shop tomorrow, what would they find? Is it properly manned? If there are deficiencies in your shop do you know what they are and why? Have they been documented and reported upward so that the appropriate level of management is aware of the situation and taking action to correct it?

• An emergency ground egress exercise was graded unsatisfactory for several reasons: Rescue personnel had to return to the crash truck for a ladder when they were unable to release the installed ladder; simultaneous extraction of front and back seaters was not attempted; the tech order was not followed for releasing the front seat pilot from personal leads, shoulder harness, lap belt and leg restraints; survival kits were not released until three unsuccessful attempts had been made to extract the crewmembers.

What about your fire/rescue personnel? How will they perform in an emergency? A commander should know. And, do your aircrews practice their emergency egress procedures to the point where both you and they are confident of their ability?

FLIGHT MANAGEMENT

• Management of the stan/eval function was weak. Flight examiners were conducting both training and testing, something hardly conducive to objectivity. There were indications of a "no-fail" program. Only one pilot had failed a flight evaluation. He was later rated as qualified, although his Form 8B indicated substandard performance.

In many cases, there was no evidence of the commander's review of the 8B. Some of the remarks by evaluators indicated that a crewmember's performance was substandard; however, he was allowed to pass the flight check with no corrective action required. Where corrective action or retraining was requested, no follow-up to insure compliance was performed.

The function of a stan/eval section is to inform the commander where weak areas exist in the training program and correct these deficiencies before

they result in a loss of life or combat potential. Unless the commander uses the section to attain this objective, he denies himself a major tool by which he can improve his operation.

HR (USAF HAZARD REPORT) DISINTEREST

• Disinterest and poor administration degraded the HR program . . . only four HRs were submitted during the first four months of the year.

A successful HR program is one that identifies hazards to the people who can correct them and that also provides feedback to those who take the trouble to submit them. Lazy, disinterested or complacent people at any stage along the HR route, from originator back to originator, can kill this program. If you are a manager, do you know how good your HR program is? Do you know how your people feel about it? Have they had results, or at least a reasonable answer? Or has their paper gone off into limbo never to be heard from again? If you identify a hazard within your unit that may also exist elsewhere, do you pass it on—or let the others find out the hard way?

AIRCRAFT MAINTENANCE

• Quality control inspectors did not use tech data during aircraft inspections.

• Although quality control inspections were in depth and detailed, managers showed little interest in correcting basic causes that persisted, as indicated by many repeat write-ups.

A function of management is the detection and correction of deficiencies. In the second case management apparently had the information but failed to exercise a primary responsibility.

• No tire inspection cage available . . . only one of three required bearing cleaning steps performed . . . prescribed mats to protect wheels during teardown and buildup were not available.

How long since the chief of maintenance took a good look at his tire shop? Good management requires leg work. Unfortunately, paperwork and other deskbound duties tend to take precedence over getting out and taking a first-hand look. When this is combined with a failure to delegate tasks, then it is possible that management will collapse right down the line.

• Some static grounds were not constructed of the proper grounding cable and bayonet plugs . . . ground wires had broken off and were tied in a knot to the clips. During this inspection an aircraft was worked on for four hours by QC with the aircraft grounded to an uncertified grounding point.

One wonders about the *quality* and the *control* in this operation.

CALIBRATION LAB

• Airlocks and doors to calibration areas were defective and caused laboratory contamination and difficulty with environmental control . . . shoe cleaners improperly located or missing from entrances . . . dust caps frequently not used . . . outgoing PME dirty . . . storage bins not labelled, making it difficult to identify incoming and completed PME . . . scheduler did not keep track of work status, and so on.

One of the most important functions in the maintenance complex is the Precision Measuring Equipment Laboratory. Would you like to depend on this one? One commander did.

VEHICLE MAINTENANCE

• Among many discrepancies at one base inspectors found: Machine shop machinery and tools dirty and greasy, floor likewise . . . paint peeling from exterior and insulation falling from walls inside building . . . TO file and office in complete disarray. An excessive number of vehicles had received recurring maintenance—electrical, brake and tuneup—four to five times in six months. Others were out of commission for months—one six months for electrical and exhaust system repairs, another for five months for electrical repair. A bus without a brakedrum and another vehicle with the engine removed were parked outside with no protection, exposing various components to the elements.

It would seem, in this case, that there was a complete absence of management, from the Motor Pool NCOIC up through the Base Commander. The condition of this facility is reminiscent of another motor pool, several years ago, that could not adequately support the fire trucks. They, in turn, failed when an aircraft crashed on the runway, leaving firemen helpless to assist the crew trapped in a burning aircraft.

These are just a few of the many instances of poor management brought to light by inspectors. Findings range from minor items to extremely serious discrepancies. But even the seemingly minor items can have serious implications. For example, at one base the crash grid maps in the field kits did not match the one in use in the command post. Could this result in confusion, serious delay and the possible loss of life in event of an aircraft accident?

An Air Force manager at any level is in a very demanding business. To be successful he must exercise not only his mind but his feet. He will also find it necessary to get his hands dirty once in a while. And he must have a certain amount of that stubborn skepticism credited to Missourians, whose favorite phrase is **"Show Me!"** ★

THE I.P.I.S. APPROACH

By the USAF Instrument Pilot Instructor School, (ATC) Randolph AFB, Texas

Q In the "IPIS Approach" article of September 1971, you stated that for an ASR approach, the radar controller is required to discontinue approach guidance when the aircraft is at the MAP or one mile from the runway, whichever is greater. The lowest published ASR minimums are ½ mile visibility and 2400 feet RVR. If I'm one mile out and can only see ahead one-half mile, how do I land?

A If the ASR approach was to a runway with **no** approach lights, the required visibility would be at least one mile. ASR minimums of ½ mile/2400 RVR for Category A and B aircraft are only authorized when the "no-light" visibility value is one mile and credit is applied for a lighting system which provides lights 3000 feet into the approach zone. These systems are coded (A), (A_1), (A_3), and (B) in the approach lighting legend of the instrument approach procedures booklet. Short Approach Light System (SALS), coded (A_2), may also be applied provided Runway Alignment Indicator Lights (sequenced flashing strobes) are added so that the total system length is 3000 feet.

Thus, when you are at the MAP one mile from the runway, you should be able to see ahead one-half mile. At least a portion of the approach light system should be visible and should provide sufficient visual cues for you to continue the approach to landing.

Q I have noticed that some non-precision approaches which appear to be straight-in, do not publish straight-in minimums. Conversely, approaches which require considerable turn to align with the runway are listed as straight-ins. What's the story?

A You've just touched on a rather complicated subject. For straight-in minimums to be published, certain TERPS criteria must be met. Basically, a straight-in approach *cannot* require the pilot to:

a. Turn more than 30 degrees to align with the runway; or

b. Side-step more than 500 feet to align with the runway centerline; or

c. Descend more than 400 feet per mile from th final approach fix altitude to the runway elevatio (optimum is 300 feet/mile). If any of these condition are violated, only circling minimums may be published

Consider an on-airport TACAN placed 550 fee from the runway centerline. If the final approach radia exactly parallels the runway centerline (090 degrees i Figure 1, Example A), a side-step maneuver of mor than 500 feet is required. If you sight the runway som distance out, the side-step maneuver would hardly b noticed. However, only circling minimums could b published even though the maneuver will appear to b a straight-in approach.

A different final approach radial may be selected b the approach designer which will eliminate the side step maneuver. In Example B, the final approach cours of 060° requires a 30 degree turn to align the aircra with the runway. This is within the criteria for straight-in approach and straight-in minimums woul be published.

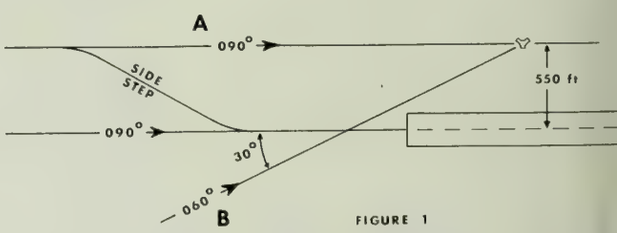


FIGURE 1

A less common problem is the descent gradient i the final approach segment. Straight-in minimums ca be published only when this descent gradient does no exceed 400 feet per mile. The example in Figure shows descent of 2100 feet in 5.0 nautical miles, 420 feet per mile. Note that descent gradient is com puted to the runway elevation and NOT to the MDA While straight-in minimums cannot be published, th actual landing maneuver may, for all practical purpose be a straight-in approach. ★

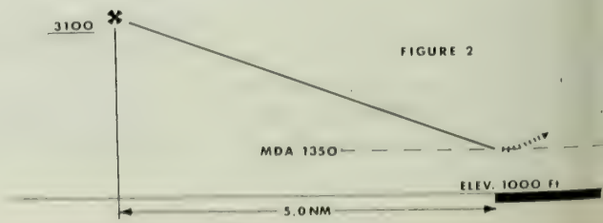
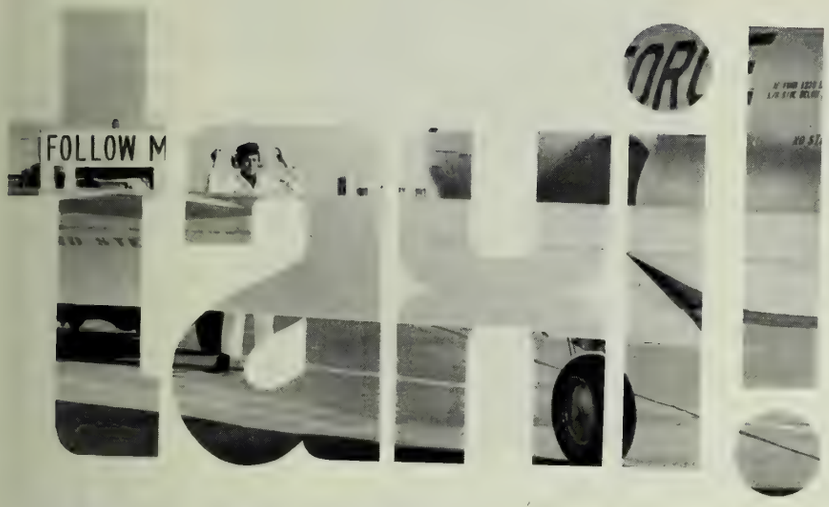


FIGURE 2



"Ladies and gentlemen, this is the captain speaking. We have just been struck by another aircraft . . ."

Disaster? No. The Boeing 707 was waiting for takeoff and was struck by a C-124 which was trying to maneuver around behind the 707 to get into run-up position. The C-124 copilot advised the pilot that it would be close, but that he believed they could clear the airliner. The scanner standing in the top hatch concurred, agreed that clearance would be minimal but stated his belief that they could clear the other aircraft. Not a disaster, but certainly a needless waste of time and resources which could have been prevented with a minimum of trouble.

In another recent mishap, a T-29 was cleared to taxi to the active runway from a civilian ramp on a large international airport. Immediately after the brake check the left wing struck a lamp post. None of the three crewmembers saw the pole.

A T-33 pilot, taxiing blithely along after landing, crumped his right tip tank on the fender of a red and white fuel truck which was parked on the taxiway. Visibility was unrestricted. Sure . . . he was following the yellow taxi line, and the fuel truck shouldn't have been where it was. But guess who bought the crump.

Sometimes it takes two or more. The F-4 crew chief gave the pilot the "come ahead" signal to pull out of the chocks . . . and watched while the F-4 taxied over the ground power unit which the crew chief had neglected to remove. Neither the crew chief nor the pilot had bothered to clear the area before taxi.

Communications can be a problem, too. While parking a B-52 after a night mission, the pilot was following an approved taxi line when he thought he received a left turn signal from the marshaller on the left wing. He obediently complied, swung 28 feet to the left and struck a blast fence paralleling the taxiway. The marshaller stated that he gave no left turn signal and, furthermore, when he saw the huge bomber swinging left he gave a series of "stop" signals. The pilot stated that he interpreted the signals as "continue straight ahead!"

AFR 60-11 says, with admirable brevity, "Aircraft will not be taxied at any time within 10 feet of an obstruction." It goes on to say that aircraft being taxied within 25 feet of an obstacle must have at least one wing-walker (two, if there are obstacles on both sides). There is a provision for excusing *locally-based* aircraft from the wing-walker rule IF:

(A) Established taxi lines are marked, AND

(B) Obstacles are either permanent in nature or consist of other aircraft parked in established parking spots.

Please note that the wing-walker exception applies only to locally based aircraft.

Prevention of taxi accidents boils down to taking a little care. Anyone who is authorized to handle an aircraft should appreciate the value of:

- Taxiing at *moderate* speed—and surely we all recognize that weather, available light, congestion, strange-field operation, etc., have a bearing on what a moderate taxi speed really is!

- Clearing the area before taxiing. Tower clearance doesn't mean that light post won't catch your wing, and the crew chief's "come ahead" won't guarantee (as we've seen) that he's removed the power cart.

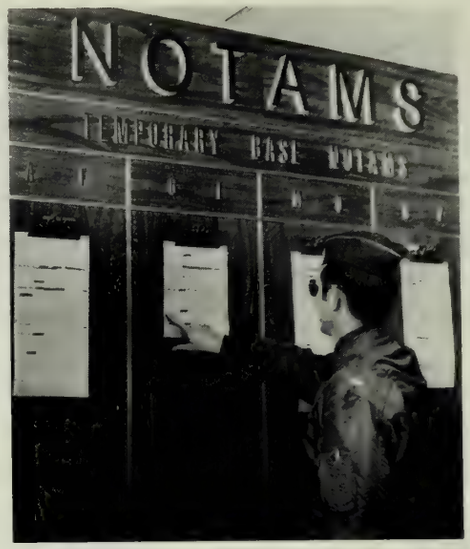
- Understanding the marshaller's hand or wand signals. One good recommendation to come out of these incidents is that anyone authorized to handle an aircraft receive annual refresher training on marshalling signals.

- Stopping the aircraft in case of doubt or confusion. It's darned hard to have a taxi accident with the airplane stopped. And the time spent in making sure the obstacle clearance criteria are met doesn't approach the time it would take to repair a wingtip (not to mention the paperwork)!

No, a taxi accident isn't usually a disaster. But it's sure a bother, and expensive. Like the old saying goes, "There's absolutely no excuse. . . ." Have a care, and you might save yourself a lot of trouble! ★



HAIRY TALES



"I should have checked the NOTAMs."

LADY LUCK WAS MY PASSENGER

With a shiny pair of wings on my left breast, I walked into Operations and reported to the senior officer. The spit-shined shoes, the tailored, crisp khakis and the snappy salute obviously reflected the recent months of cadet military training.

"Lt Sharpie reporting as ordered, sir."

"Sam, I have to send two T-Birds to McClellan AFB by tomorrow afternoon for inspection and depot maintenance. I want you to take one since I'm short of pilots. You will leap off in about two hours on Major Oldhead's wing. Any questions?"

"Yes sir. Will we be going direct to Sacramento today?"

"No, I believe Major Oldhead wants to RON in the Los Angeles area tonight and then fly into McClellan tomorrow morning when the weather lifts. I know you're just out of pilot training, but stick with Major Oldhead and you shouldn't have any problems."

As an eager young member of the flying fraternity, I gathered all my flying gear and rendezvoused with Major Oldhead at Base Operations. The older pilot briefed the flight plan, but not with the thoroughness required by Air Training Command regulations.

"We'll one-hop it into Williams AFB and gas up, then smoke into Los Alamitos NAS where we'll RON. I have some friends I want to visit tonight. When McClellan's weather lifts tomorrow, we'll leap off and get the birds there on time. Normal formation procedures will apply. I'll lead, do the navigating and radio chatter. Any questions?"

"No sir!"

The two T-Birds taxied onto the active runway and stopped in front of mobile control for run-up. After quickly checking his instruments, the leader looked back at his young charge. I nodded and we started rolling.

After 1000 feet of roll, I fell behind and announced:

"Tiger 2 aborting. Fuel fumes are coming in through the pressurization vents."

"Rog, two. I'll go on and wait for you at Willie. Get your bird fixed quickly. We want to get to L.A. by sunset."

"Rog."

The fuel fumes were indeed coming into the cockpit, as was fuel. A check valve in the tip tank pressurization system was stuck open allowing introduction of fuel into the cockpit air conditioning system. Maintenance quickly analyzed the malfunction, but was unable to repair the aircraft right away.

Finally, after repairing and checking the aircraft properly, maintenance released it to me; but the hour of sunset in Texas had long passed. However, the mission to deliver the aircraft to McClellan AFB still existed. Within a half hour, one lonely T-Bird sped down the runway and into the night.

The flight to Arizona was beautiful. The full moon, the bleak West Texas landscape and the cloudless sky all emphasized to me that I had *"slipped the surly bonds of earth and danced the skies on laughter silvered wings. . . ."*

After a "grease job" landing at Williams AFB, I strode into Base Operations and inquired about Major Oldhead. "He left you this note, Lieutenant. Wants you to meet him at McClellan tomorrow by noon," the dispatcher blurted out.

I took a quick look at the wall map and checked the time. I estimated arrival at L.A. by midnight.

—After being away from home for almost two years, it's going to be great to see my mom and two brothers. I won't call them now. I'll wait until I land. Shouldn't take too long for them to drive out with all those new freeways.—

The thoughts of the reunion went through my mind as I calculated the distance and heading from Phoenix to Los Angeles.

"No sense in going too high on this one. I've got plenty of gas."

The minutes seemed to pass more slowly now as the waning period of another calendar day was coming to an end. The silver T-Bird knifed through the dark desert night westward toward the Pacific coast. As a young lad growing up in the city of Los Angeles, I had often dreamed of flying toward my hometown from the vast expanse of the desert. I had read many descriptions of aerial views of this city of millions of lights that was sprawled in a basin surrounded on three sides by mountains and on the fourth by the sea; but I had never personally seen this spectacle. Now, flying my own bird, I was about to gaze upon one of the most beautiful man-made artistic patterns. As I came closer to the glow on the horizon, I lost even more altitude to skirt over the mountains low enough to suddenly come upon the edge of the bowl of lights. Weather predicted clear skies with no smog, but a strong chance of fog developing along the coast after midnight. The myriad of lights came into view, and the sight was indeed as I had read and heard of so many times. For miles in every direction I was surrounded by multicolored lights and highways. But, it was time to land since traces of fog were forming along the coast and in patches inland. I called Los Alamitos tower:



"Los Alamitos, AF jet 1234, over."

No response!

"Alamitos tower, AF jet 1-2-3-4, how copy?"

Still no response as the aircraft approached the hazy coastline.

Hm-m-m, better circle a bit until I obtain landing instructions. I wonder which of those fields is Alamitos. I'll call Long Beach and check my radios.

"Long Beach tower, AF jet 1234, over."

"AF jet 1234, this is Long Beach, go ahead."

"Say, Long Beach, would you call Alamitos tower for me and see if their radios are on and would you get landing instructions for me, please?"

"Rog, -34, stand by."

Several minutes passed as the T-Bird circled over the bright city, descending slowly.

"AF jet 1234, this is Long Beach. Be advised Alamitos is off the air. They shut down at sunset, you know. This information is in the NOTAMS. They advise you go to an Air Force Base, over."

"Oops, my apologies to Los Alamitos. I have a change in flight plan. Ready to copy?"

"Rog. Go ahead."

"Rog. I'll land at uh, uh . . ."

I thought of the several Air Force bases that were in the area and related them to driving distance from home.

". . . uh, Norton AFB."

"Rog, we have that and we'll relay to flight service. Good luck. Long Beach out."

Now the problem of finding Norton AFB existed. Charts and maps quickly filled the cockpit. However, because of a weak flashlight, low altitude and the knowledge of being near home, I did not continue a logical search for the solution of my problem. Instead, distracted by a low fuel warning light, I decided to use some skill and cunning in order to save time.

"Norton tower, AF jet 1234, over."

"1234, this is Norton, go ahead."

"Rog, Norton, land one T-Bird, VFR."

"Rog, 1234, Norton landing 05, winds calm, altimeter 29.97, report initial. Pattern altitude, 3200 feet. Be advised patches of fog south and west."

"1234, Rog."

Armed with this new information, I headed in the general direction of San Bernardino and, mentally aligning myself with 05, called:

"Norton, would you turn up your runway lights, please?"

At that instant, it seemed that all of the runway lights in the basin, aligned with 05°, went full bright. To complicate matters, the amber fluid that once filled the fuel tanks was almost gone.

"Norton, sorry to bother you again, but could you please flash your runway lights a couple of times?"

The flicker of a parallel row of lights shot through the glare of the many lights below like one of the search lights used at a Hollywood



premiere. A subsequent diving maneuver put the T-Bird on initial at the prescribed altitude with more airspeed than called for. However, a judicious use of speed brakes prior to the pitch soon brought everything back to normal and again another *grease job* landing ensued.

As I shut down the engine and looked up at the moon, now partially hidden by the forming fog, I thought: . . . *"and, while with silent, lifting mind, I've trod the high untrespassed sanctity of space, put out my hand, and touched the face of God."*

If the aircraft in this incident had ended up as a pile of deformed metal and plexiglas, the Flying Safety Officer investigating the results would have traced the cause to several factors. Fortunately, I completed my mission and did not have to explain what had transpired. But in my own mind, I knew that I had come close. Pride kept me from disclosing any of the details of this mission. As far as anyone was concerned, this was another normal point A to point B flight.

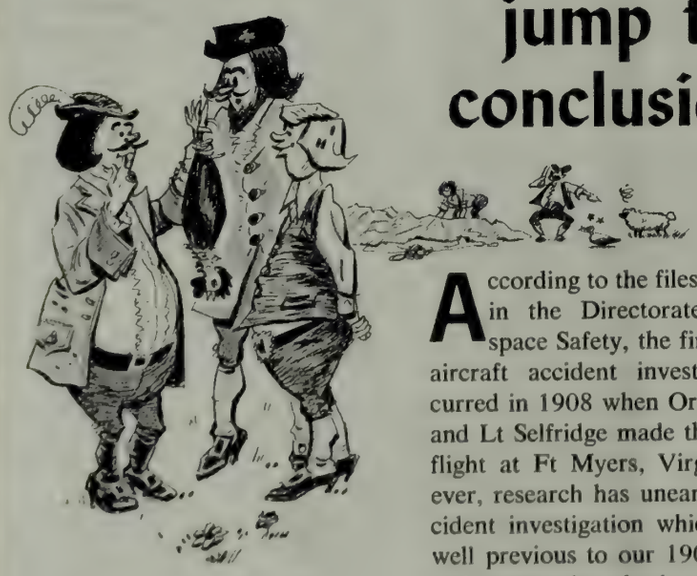
However, had I told the Flying Safety Officer all that had happened, corrective action could have been taken to prevent other pilots from running into the same problems. Serious deficiencies in the areas of maintenance, operations, training and overall flight management were evident in this episode, as you must agree. These deficiencies, however, did not come to light until a series of subsequent aircraft accidents. The resultant investigations and reports indicated a need for drastic changes within the organization, but only after the loss of several lives and airplanes.

Anonymous reports of close calls are necessary and valuable tools that every Flying Safety Officer uses to prevent accidents. Every Flying Safety Officer vigorously seeks to investigate these anonymous reports, whether they be formal USAF Hazard Reports or just written notes. Not to do so eventually results in longer, costlier and oftentimes painful formal investigations.

Have you had a close call recently? Let your Flying Safety Officer know about it immediately. Let him know **now** before someone else trods *"the high untrespassed sanctity of space"* and is not as fortunate as I. ★

IN ACCIDENT INVESTIGATION

Don't jump to conclusions



According to the files maintained in the Directorate of Aerospace Safety, the first recorded aircraft accident investigation occurred in 1908 when Orville Wright and Lt Selfridge made their ill-fated flight at Ft Myers, Virginia. However, research has unearthed an accident investigation which occurred well previous to our 1908 accident.

It seems that the brothers Montgolfier, Stephen and Joseph, had been experimenting with large paper bags which they filled with smoke, their mistaken theory being that they were creating a cloud which would ascend to the same height as other clouds. In any event, they constructed their balloon of linen covered with paper to a size of 52,000 cu ft and launched it from Versailles on 19 September 1783!

A small car was attached, in which were placed a sheep, a cock, and a duck, which thus had thrust upon them the distinction of being the first balloonists. The descent occurred eight minutes after the start, and the sheep and duck were uninjured. The cock had not fared so well, and his condition was gravely attributed by the savants present to the effects of the "tenuous atmosphere of the upper regions." Calmer subsequent diagnosis, however, indicated that he had been tramped upon by the sheep.

MORAL: The investigating members of the board should not let themselves be influenced by savants! ★

LIFE SUPPORT BRIEFS

MAJ CHARLES LEHMAN, Directorate of Aerospace Safety

T-33—'TAINT SO

"I know the Dash One says the T-Bird seat will get me out at zero altitude and 120 knots if everything is perfect, but I'm sure not going to go out on the deck right after takeoff if I can zoom."

That kind of thinking *can kill you*. But isn't altitude always your best friend in an ejection? Well, usually it is—but in the T-Bird there are some other considerations.

The key here is airspeed. That wonderful rush of wind is the *only* thing that will pull your nylon security blanket out of the pack. In the case of T-Bird chutes, it takes about 85 knots to do the trick. Any less and that chute is going to be mighty slow in opening.

Let's say your bird quits at 50 feet on takeoff from a 5000-foot strip. You've got 150 knots, so you zoom for an up vector and all the altitude you can get. Right?

Wrong! If you zoom to 200 feet and 110 knots, you're in trouble!

It takes about one second after you leave the cockpit before you start separating from the seat, which pulls your lanyard. During that second you lose almost half your airspeed. And that's the stuff that opens parachutes. By the time your lanyard pulls the rip cord pins, you don't have enough airspeed to open your chute reliably. Now there's only one way to gain airspeed without an engine—dive. But you'll be diving toward the ground without wings. At 32 ft/sec/sec it's not hard to figure out that falling is a poor way to get airspeed to open a parachute. You have to fall a long way to get that 85 knots.

The lesson here is simple. On a very low altitude ejection, try to zoom for an up vector and more altitude, but *don't ever go below the Dash One minimum ejection airspeed*.

WHAT A WAY TO GO

Over the years we've lost a lot of people because their parachutes were exposed to fire. Sometimes it happened in the cockpit, and sometimes the chute was burned as it passed through the crash fireball during parachute descent. Either way the canopy failed, and the man under it fell to his death.

Well, the Life Support System Program Office (SPO) is doing something about it. They're trying to develop fire-resistant parachutes. The biggest problem is the bulk of current canopy fabrics. If Nomex or some other material can be made to about the same bulk as parachute nylon, maybe we'll be able to survive pre-ejection flash fires, or excursions through a fireball.

PHOR PHANTOM PHLYERS

Those pesky F-4 leg garters may soon go the way of leather helmets and silk scarves. An electromagnetic restraint system is in the mill to eliminate all the straps and buckles. With this system you'd simply wear a little metal plate in a pocket on the rear calf of your "G" suit. An electromagnet would lock your calves to the seat during ejection to keep your tootsies from flopping. As soon as you're safely out, and slowed down a skosh, the magnet loses power and normal sequencing continues. The prototype was shown at Langley in December. We should have some operational tests in a year.

NOMEX

Those Nomex flight suits have already made some pretty spectacular saves, but they have one little quirk—they only protect what they cover. If your arms hang out of sleeves that have been chopped off, you can get burned. You wouldn't cut a piece out of your parachute to make it more comfortable would you? Leave the sleeves on, and if you roll them up while you're in the squadron area or at the stag bar, roll 'em down before you fly!

PAT HAND—ALL ACES

There's a new ejection seat on the horizon—ACES. The Advanced Concept Ejection Seat (ACES) was conceived to meet the escape needs of the new generation of aircraft. The seat is designed to give a stable ride; get you out safely at zero altitude—even with a high sink rate; eliminate seat/man/chute involvement; provide a hit-and-run survival kit for combat, plus a normal kit; and allow single point release for ground egress. In tests it met and exceeded our expectations. ★



SEE IT LIKE IT IS

Water doesn't present much of a problem for a fish; he sees better in it than out of it. Pilots, on the other hand, are bothered a lot by water, especially when trying to fly through it.

Rain causes poor visibility, reducing the amount of light available. Water on the windscreen also induces a refraction error which makes objects appear lower than they really are. It works like this:

First, the reduced transparency of the rain-covered windscreen causes the eye to perceive a horizon below the true one (because of the eye response to the relative brightness of the upper bright part and the lower dark part). Second, the shape and pattern of the ripples, particularly on sloping windscreens, causes objects to appear lower. Either condition may be present. If both are present, the effect is cumulative and may be as much as five degrees, or a 100-foot error each 1200 feet of lateral distance.

Conventional methods of clearing water off the windscreen aren't always very effective, and the problems occur in almost any kind of aircraft you could name:

- A twin-engine prop-type transport was involved in a major landing accident during a heavy rainstorm. Water on the windscreen hindered visibility to the point that the pilot, erroneously thinking he was approaching the threshold, crashed well short of the runway.
- At least one jet fighter-type aircraft has experienced instances of overheated and cracked windscreens when the jet blast rain removal system was left on during taxi.
- An OHR from an armed-recce pilot complained that the windshield wiper on his bird didn't clear the part of the windscreen the pilot looks through.

In response to the problem, SMAMA's Service Engineering Division conducted an expedited investigation, running tests of rain repellent products. Tests were conducted in various locations, in such diverse aircraft as the F-104, F-84, F-100 and EC-121 aircraft, and it looks like they have come up with a winner.

The product is REPCON (for Rain Repellent and Surface Conditioner), Federal Stock Number 6850-139-5297.

REPCON uses an isopropyl alcohol carrier with a silicon wetting agent. It is applied manually to the windshield, using a soft cloth. The alcohol then evaporates, leaving the wetting agent on the windshield, which is then polished with a clean, dry cloth to remove excess residue. The wetting solution makes the windshield very smooth and causes the water to bead. The water then flows readily off the windshield. A small amount of wind or use of blowers or windshield wipers enhances the performance even more.

One application is good for at least 50 flight hours under normal flight conditions. During continuous rainy weather, REPCON should be applied each 25 flight hours.

The photo at the beginning of this article was taken from the cockpit of a C-121G in landing configuration with windshield wipers OFF. REPCON has been applied to the copilot's window and to the right half of the center panel. The remainder of the windscreen is untreated. Note the clarity of the VASI lights and the runway sideline on the right, contrasted with the hazy images and glare-filled screen on the left. Aircrews flying the tests stated that the photograph is conservative; that the difference, as seen from the cockpit, is actually much more pronounced, and that even with the windshield wipers on high speed the difference was significant. The treated windshield, in fact, made the difference between seeing the ground and not seeing it in some phases of flight.

There seem to be no disadvantages to using the solution. Pilots involved in the tests liked the results: no change in index refraction; no film buildup; no effect from light exposure, throughout the spectrum from ultra-violet to infra-red; no effect from high temperature; and no objectionable side effects.

The stuff is cheap (less than ten cents per application) and can be applied by hand in three minutes to a clean, dry windscreen. It will clear the complete windscreen and canopy, reduce runway light glare, and may eliminate the need for hot air rain removal systems which waste air needed for thrust (!) or air conditioning.

REPCON is fully approved and recommended by SMAMA for all aircraft windshields and canopies that are either glass or plexiglass. The solution hasn't yet been available through USAF supply channels, but should be any day now. Meanwhile, units can purchase immediate requirements directly from the manufacturer. TO 42D4-1-4 will provide instructions for application. ★



SSgt Charles Brown watches as 1/Lt William Campenni logs the 100,000th flying hour since the last jet fatality in the 112th Fighter Group (top). TSgt Earl Ferricks greets Captain William Gadd on completion of 50,000 flying hours since the Group's last aircraft accident.

FTR GP FLIES 50,000 HOURS ACCIDENT FREE

When Capt Bill Gadd landed his F-102 at Greater Pittsburgh Airport last Oct 27, he had just logged the 50,000th hour since the 112th Fighter Group's last accident.

The Pennsylvania Air National Guard unit had barely finished celebrating when another milestone was recorded. This time the honors went to Lt Bill Campenni. When he touched down, the 112th had completed 100,000 hours of single engine jet time since a fatality.

The unit's last fatal accident occurred in 1962 when a C-47 crashed. The last jet fatality was on 19 Feb 1956, when an F-84F crashed after a low altitude engine failure, due to center main bearing failure.

Col Edward J. Bollen, commander of the 112th, is proud of the unit's accomplishments. But, he says, "the great work of a lot of fine controllers in the Cleveland Center and Pittsburgh Approach Control have helped make it possible. We think those guys are the greatest."

The 112th's record represents time in T-33, F-84F, F-86L and F-102 aircraft.

Well Done! ★



The information contained in this directory is the latest available, and includes all currently operating aero clubs. If there are any inaccuracies, please forward corrections to Aerospace Safety for publication.

Read the directory like this: Base name, hours of operation, fuel octane available and phone number. All clubs have oil available. Clubs located on base are printed in black, and those located off base are in color with the name of the airport. HAPPY LANDINGS!

STATE, CLUB & FLYING LOCATION	SERVICE AVAILABLE	PHONE NO.
ALABAMA		
Maxwell-Gunter AFB (AU) Maxwell AFB AL 36114	0800-Sunset 80/100	293-6212
ALASKA		
Eielson AFB (AAC) Eielson AFB AK	0830-1400 80	377-1223
Elmendorf AFB (AAC) Elmendorf AFB AK	24 Hours 80	752-4167
ARKANSAS		
Blytheville AFB (SAC) Blytheville AFB AR 72315	0730-1700 80/100	763-9305
Little Rock AFB (TAC) Little Rock AFB AR 72076	0730-Sunset 80/87	988-1234
ARIZONA		
Davis Monthan AFB (SAC) Davis Monthan AFB AZ 85707	0800-1700 80	327-7632
[illegible]	[illegible]	932-3911

STATE, CLUB & FLYING LOCATION	SERVICE AVAILABLE	PHONE NO.
CALIFORNIA		
Beale AFB (SAC) Beale AFB CA 95903	0900-1700 80/100	788-2220
Castle AFB (SAC) Merced Muni Aprt Merced, CA	0800-Sunset 80/100	722-3638
Edwards AFB (AFSC) Edwards AFB CA 93523	0730-1630 80/100	277-2474
Hamilton AFB (ADC) Hamilton AFB CA 94934	0800-1700 115/145	838-3800
March AFB (SAC) March AFB CA 92508	0800-1700 80	655-3980 653-7912
Norton AFB (MAC) Norton AFB CA 92409	0800-1700 80/100	885-5812
Travis AFB (MAC) Tolinas Air Strip Travis AFB CA 94535	0800-Dark 80	437-3470 437-2880
Vandenberg AFB (SAC) Vandenberg AFB CA 93437	0900-1800 80	734-5328
COLORADO		
Ent AFB (ADC) Peterson Field Colorado Springs CO 80912	24 Hours 80/100	635-8911 Ext 4310
Lowry AFB (ATC) Buckley Field Denver CO	0730-1600 [illegible]	553-3660 Ext 508
USAF Academy (USAFA) USAF Academy Air Field Colorado Springs CO 80840	0800-1800 80/100	472-4423
FLORIDA		
Eglin AFB (AFSC) Eglin AFB FL 32542	0730-Sunset 80/100	822-5948/5559
Patrick AFB (AFSC) Patrick AFB FL 32925	0800-1700 (24 Hr notice required) 80/100	494-4356
Tyndall AFB (ADC) Tyndall AFB FL 32401	0800-1700 80/100	286-5870

STATE, CLUB & FLYING LOCATION	SERVICE AVAILABLE	PHONE NO.
GEORGIA		
Moody AFB (ATC) Valdosta Muni Aprt Valdosta GA 31601	Daylight 80	244-1527
Robins AFB (AFLC) Robins AFB GA 31093	0800-1700 80	922-2634
HAWAII		
Hickam-Wheeler AFB (PACAF) Wheeler AFB HI 96515	0730-1900 80	656-161
ILLINOIS		
Chanute AFB (ATC) Chanute AFB IL 61868	Closed to transient aircraft.	893-9181
Scott AFB (MAC) Scott AFB IL 62225	0930-1730 Daily 0800-1700 Weekends	256-4394
INDIANA		
Grissom AFB (SAC) Grissom AFB IN 13440	Daylight 115/145	330-7145
KANSAS		
Forbes AFB (TAC) Forbes AFB KS 66620	0800-1700 80	862-0721
McConnell AFB (TAC) McConnell AFB KS 67221	Daylight 80	685-6731
LOUISIANA		
Barksdale AFB (SAC) Barksdale AFB LA 71110	0800-1630 80	423-8871
England AFB (TAC) England AFB LA 71301	24 Hours 80	448-5609
MAINE		
Loring AFB (SAC) Loring AFB ME 04750	0830-1230 115/145	328-3207/ 7440
MARYLAND		
Andrews-Bolling AFB Hyde Aprt (HQ COMD) Clinton MD 20735	0800-Dark 80	297-9229
MASSACHUSETTS		
L. G. Hanscom Fld (AFSC) L. G. Hanscom Fld MA 01730	24 Hours 80/100	861-5731
Otis AFB (ADC) Otis AFB MA 02542	Daylight 115/145	563-2986
Westover AFB (SAC) Westover AFB MA 01022	24 Hours 80	593-3183
MINNESOTA		
Duluth Intl Aprt (ADC) Duluth Intl Aprt MN 55814	0730-2030 80	727-7615
MISSISSIPPI		
Keesler AFB (ATC) Keesler AFB MS 39534	0700-1800 80	868-3849
MISSOURI		
Whiteman AFB (SAC) Whiteman AFB MO 65301	0800-Sunset 80	563-3311
NEBRASKA		
Offutt AFB (SAC) Offutt AFB NB 68113	24 Hours 80/100	292-1517
NEW JERSEY		
McGuire AFB (MAC) McGuire AFB NJ 08641	0800-1700 80	723-4900
NEW MEXICO		
Holloman AFB (TAC) Midway Airport NM 88310	Daylight 80/100	437-0490
Kirtland AFB (AFSC) Kirtland AFB NM 87117	Prior request 80/100	242-4184
NEW YORK		
Griffiss AFB (SAC) Griffiss AFB NY 13440	Daylight 115/145	330-7145
NORTH CAROLINA		
Seymour-Johnson AFB (TAC) Seymour-Johnson AFB NC 27530	0730-1700 80	736-1864

STATE, CLUB & FLYING LOCATION	SERVICE AVAILABLE	PHONE NO.
OHIO		
Wright-Patterson AFB (AFLC), Wright-Patterson AFB OH 45433	0900-1800 80/100	255-4848
OKLAHOMA		
Tinker AFB (AFLC) Tinker AFB OK 73145	0830-1800 80	732-7321 Ext 2467
Vance AFB (ATC) Vance AFB OK 73701	0700-Sunset (By Request) 80	234-6241
SOUTH CAROLINA		
Charleston AFB (MAC) Charleston AFB SC 29404	0800-1600 80	747-4111 Ext 3614
Shaw AFB (TAC) Shaw AFB SC 29152	0800-Sunset 80/100	666-3123
TENNESSEE		
Arnold AFS (AFSC) Arnold AFS TN 37389	0800-1700 Mon-Fri 80/100	455-2611 Ext 7621
TEXAS		
Bergstrom AFB (TAC) Bergstrom AFB TX 78743	0800-Sunset 80	385-4100 Ext 2301
Randolph AFB (ATC) Randolph AFB TX 78148	0830-1900 80	652-5349
Sheppard AFB (ATC) Sheppard AFB TX 76311	0800-1700 80	736-2160
Webb AFB (ATC) Webb AFB TX 79720	1000-1800 80	263-1344
UTAH		
Hill AFB (AFLC) Hill AFB UT 84401	0800-Sunset 80/100	621-5535
VIRGINIA		
Langley AFB (TAC) Langley AFB VA 23365	0800-Sunset 80/100	764-2743
WASHINGTON		
Fairchild AFB (SAC) Fairchild AFB WA 99011	0800-1700 80/100	244-9292
PUERTO RICO		
Ramey AFB (MAC) Ramey AFB PR	0730-2200 100	22251 7287
EUROPEAN AREA		
Bentwaters/Woodbridge (USAFE), RAF Bentwaters, Suffolk, UK	Daylight 91/96	-2557
Bitburg Air Base (USAFE) Bitburg AB, Germany	Sunrise-Sunset 80	-7410
Camp New Amsterdam (USAFE) Hilverton Airport The Netherlands	0900-1800 80/100	02157-348
RAF Lakenheath (USAFE) RAF Lakenheath, Suffolk UK	Sunrise-Sunset 80	Eriswell 2551 Ext 2106
Sembach Air Base (USAFE) Sembach AB, Germany	0800-Sunset 80/87	06302-7-7630
Torrejon Air Base (USAFE) Torrejon AB, Spain	Sunrise-Sunset 115/145	-6457
RAF Upper Heyford (USAFE) Upper Heyford, England	Sunrise-Sunset 100	-2893
PACIFIC AREA		
Air Forces Korea (PACAF) Kunsan & Osan AB, Korea	Daylight 80	4424
Clark Air Base (PACAF) Clark AB, Philippines	0600-1800 100	23214 23182
Kadena Air Base (PACAF) Yontan Airfield, Okinawa	Daylight 115/145	24296 24460
Kanto Plains (PACAF) Yokota AB, Japan	0700-2400 115/145	225-8925
Misawa Air Base (PACAF) Misawa AB, Japan	24 Hours 87/115/145	3381

Ops topics

LOOK OUT!

The O-2 was on a dual, continuation-training mission at a civilian airport. On downwind for the fourth landing, the pilot placed the gear handle down, but at that time both pilots were distracted by the erratic flying of a light aircraft in the pattern. Their concern for avoiding the other aircraft, which forced them to a wider than normal base leg, was sufficient distraction to cause neither pilot to check for positive gear down indications. And, of course, in accordance with Murphy's Law, the gear extension system chose this time to malfunction. The result was a great screeching of metal, bending of props, reddening of faces and spending of money.

Boy, is that an old song! Anytime something unusual happens in a landing pattern or while running a checklist—any distraction that breaks the normal train of events—there ought to be a great, big, neon light flashing in our minds, saying "LOOK OUT!"

Several recommendations come to mind:

- If something happens in the pattern that forces an alteration of the normal landing sequence, break out and re-enter. Insistence on a normal approach and adherence to standardization will all but eliminate the inadvertent gear-up landing.
- If a checklist sequence is broken by some external distraction *start the checklist over!* It doesn't take that long to run a before-landing checklist, and the peace of mind is beyond price.
- Be on guard against distractions and disruptions of routine. Keep that neon sign flashing and LOOK OUT!

TAKE A VOTE

The aircraft commander of the C-130 thought the ailerons were a bit stiff immediately after the bird broke ground. It seemed as though too much force was required to obtain the desired bank angle. He thought it might have been his imagination, though, and didn't mention the problem to his copilot. When the mission they were on was aborted (for reasons unrelated to the condition of the airplane), they returned to their local area for transition work. The pilot turned the aircraft over to the copilot for proficiency work, and the copilot immediately complained about the force required to move the ailerons. The A/C took the controls back and landed the aircraft—full stop.

Now it shouldn't take a committee to decide something is wrong with the control system of an aircraft; but as long as there's one available why not use it? One of the benefits of having two pilots and an engineer up front in a complicated aircraft is the capability of talking over a problem and arriving at a solution. The A/C in this case could have given the controls to the copilot soon after takeoff (without saying anything about the problem) to test the copilot's reaction to the controls, and put to rest any doubts he had about the airplane's condition . . . or about his imagination. Failure to use the rest of the crew to lighten the cockpit workload is a little like opening a can by bashing it against the corner of your electric can opener; you're using the tools, all right, but not the way they're intended to be used.

Maintenance could not duplicate the malfunction. However, this was the first flight since the replacement of the aileron boost assembly, so the unit replaced the booster package a second time, flew a FCF on the bird, and cleared the problem.

HURRY UP AND WAIT

On takeoff roll, just at liftoff, tower advised the OV-10 pilot that the left rear canopy door had opened. The pilot continued his takeoff and requested closed traffic. As he turned downwind, at 120 KIAS, the canopy door departed, struck the right prop blades, punched a small hole in the right side of the fuselage and dented the leading edge of the elevator. The pilot continued his pattern and landed without further incident.

There is evidence that the pilot did not make a thorough preflight inspection. He was under pressure, launching on a search/rescue operation. The tendency under these conditions is to resort to taking shortcuts such as kicking the tires, cranking the engines and getting airborne. Experience proves, however, that the time saved doing this is almost never of significant value. Spending the time required to insure that the job is done right often *saves* time as it certainly would have in this case!

HIGH--BUT WITHIN LIMITS

The T-33 was scheduled for an FCF following an engine change. During engine start EGT rose to 880 degrees C.—high, but not exceeding the 900 degree limiting temperature, so the FCF was continued. Takeoff EGT was normal; but during climb the EGT rose again, to 750 degrees, and the fire warning light began flickering on and off. When the pilot retarded the throttle, the EGT dropped back to the normal range and the fire light went out. The pilot then declared an emergency, flew a minimum-power flameout pattern and landed without further incident.

Okay, okay—the starting EGT was within limits. But it wasn't *normal!* Now let's be sensible—if you go out every day for a month and start up a T-Bird, and the EGT on start always runs around 750 degrees—and on the thirty-first day the starting EGT tops out at almost 900 degrees (which is the engine-change point) —*something is wrong!* Don't fall into the old "Well, it was within limits" trap. If that engine tries to tell you something, LISTEN TO IT!

Incidentally, maintenance changed engines and finally replaced the starter fuel control—which was defective.

FLIP CHANGES

Revised Schedule for Section IIA FLIP Planning: Beginning 2 March 1972, Section IIA Charts and Book will be revised and distributed together every 56 days. Three cumulative planning change notices updating those products will be distributed at 14-day intervals, (i.e., 14, 28 and 42 days), after the publication date.

J-Bar/Arresting Gear: Commencing with the 6 Jan 1972 IFR Supplement, Jet Barrier/Arresting Gear cautionary notes are no longer included in the aerodrome remarks section.

GOOD JOB!

There has recently been a sizable influx of new pilots to MAC'S C-141 wings, and this has naturally posed an experience-level problem in aircrew management. Several wings have established the policy that, when the crew includes a fully-qualified aircraft commander and first pilot, one of the new pilots will be sent along as third pilot; the purpose, of course, is to provide the new pilots with the opportunity to observe MAC's world-wide operation from the ground up, so to speak.

Recently a C-141 took the active at an overseas base and started its takeoff roll. The crew included one of the "third pilots." As the aircraft accelerated through 40-50 knots, the third pilot, from his position in the jump seat, called "REJECT"—and the aircraft commander, with great respect for his continued good health, complied. Turned out that the young man in the jump seat had noticed the elevator trim passing four degrees UP. By the time the aircraft had rolled to the end of the runway, the trim was passing 12 degrees UP.

The third pilot should be commended for his sharp-eyed alertness; the aircraft might have been controllable after takeoff, but then again, it might not! And the aircraft commander should be commended for the atmosphere of crew coordination—even including the "extra" crewmember—which he obviously maintained on the flight deck of his aircraft.

OPS cont'd

BATTEN DOWN THE HATCH

As the T-38 taxied in from a dual instrument mission, the student opened his canopy. From the corner of his eye, he saw something flash by. Simultaneously, the IP noticed the EGT on the right engine increasing and shut the engine down.

Investigation revealed a U.S. High Altitude Approach book on the front frame of the compressor. The student had failed to insure that all his publications were in the map case prior to opening his canopy.

PARTIAL PANEL RECOVERY

In earlier days of aviation, student pilots undergoing instrument flight training were suitably impressed with the necessity for becoming proficient in partial panel instrument flying. Partial panel was something that was drummed into the student during basic instruments and remained with him the rest of his career. On any given instrument check, the pilot who could perform well on partial panel was usually assured of a "pass," but poor partial panel performance probably caused more pink slips and aggravation than any other single factor relating to instrument flight.

Today, even though there is less emphasis on partial panel instrument flight than there once was, and the occasions when its use becomes a necessity are rare, the following incident proves the value of partial panel proficiency and awareness.

Reported ceiling was 350 feet, and an F-4 was on GCA final with 4500 pounds of fuel remaining. The pilot was on instruments, with no outside references, when the VVI began indicating a climb—even though the ADI continued to show a descent. The pilot immediately initiated a partial panel recovery to "on top" and VFR conditions. After getting in the clear, the ADI appeared to be working normally, but the pilot was experiencing a bad case of vertigo. Because of this he declared an emergency and requested a letdown on the wing of another aircraft. Subsequently, an F-4 in the area joined him and brought the ailing *Phantom* down for an uneventful landing.

During bench check, the ADI was found to be sticking in pitch and roll.

This incident points up the necessity for constant full-panel cross-check of instruments when flying solely by reference to the gages. Although partial panel instrument flight in modern jet aircraft is strictly an emergency procedure, partial panel proficiency is good life insurance. Ask yourself: How would you have done in the situation above? How about your students? Or the last guy you gave an instrument check to?

(—from U. S. Navy WEEKLY SUMMARY)

NEAR-MISSED APPROACH

The EB-66E pilot called Command Post 100 miles out and asked for the current airfield status and weather. The weather reported at the time was 3000 and six, thunderstorms southwest and overhead moving northeast, occasional lightning and moderate rain showers. The pilot requested a GCI/GCA approach and was cleared to the initial approach fix for runway 24.

At four miles, on final, the aircraft entered heavy rain, and at three miles the controller called that he had lost radar contact and directed the pilot to make a missed approach, if the field was not in sight.

One-half mile from the threshold, and still descending, the aircraft struck a power line. Immediately afterwards, the aircraft broke out of the overcast abeam the threshold and left of course, and the pilot executed his missed approach. During the missed approach the crew noted a right yaw, the left main gear indicating an intermediate position, the right engine EGT at 800 degrees C. and the RPM decreasing. The pilot shut down the right engine and maneuvered the aircraft to a clear area to recycle the landing gear. After cycling, they got a safe down indication on all three and the pilot maneuvered the aircraft to a successful single-engine landing.

This was only an incident—even though it cost twenty grand to fix the airplane—but it came awfully close to being a messy major accident. The pilot stated that, when radar contact was lost, he immediately transitioned to a TACAN approach/missed approach. He also stated that he had mild vertigo and that he thought he had broken the descent. In our book, there's no such thing as a "TACAN approach/missed approach," and having even a mild case of vertigo should dictate an immediate and *positive* missed approach. Additionally, the MDA for the TACAN approach is 300 feet AGL, and the DH for the PAR is 200 feet AGL, and neither the navigator nor the EWO advised the pilot that he was passing either altitude.

It seems safe to say that no one on this crew had a very high regard for his own safety or for the loss in combat effectiveness represented by the damaged aircraft. They're darned lucky they're still around to profit from their mistakes.

And maybe the rest of us can learn something, too. ★

REX RILEY'S
CROSS COUNTRY NOTES

Like everybody else I'll do some talking about the weather in hopes that maybe we can do something about it. Not that we can change it but perhaps we can avoid painting ourselves into a box. An airplane driver friend of mine dropped into the office the other day with a question about a problem he ran into while cross-country. Seems he received his weather briefing at 0730 with a proposed departure of 0830. The destination was forecasting an 8000 foot ceiling with no significant weather. He launched on time for a one plus 30 enroute. Being alert to the possibility of any weather situation changing on any flight, he contacted the enroute forecaster and found that the ceiling was now 500 overcast with rain (as it turned out, heavy rain). After landing he stormed into the weather office ready to do battle but found that he had to stand in line behind four other pilots with the similar complaint, that what they had experienced and what had been forecast were worlds apart. The forecaster at destination told them all that an amended forecast had been put on the wire at 0800. However, when a message goes on the wire at a certain time it doesn't mean that all stations will get it immediately. One of the questions that arose out of our discussion was, does the Weather Service have the responsibility to contact the pilot when there is such a radical change in the amended forecast? The obvious answer is no, the pilot is the one ultimately responsible for making sure that the weather is okay at his destination. No procedures have been established that task any of the weather personnel to track down the pilot and warn him . . . some forecasters do, but it is unlikely to happen if the weather station is busy. So, the moral to this story is, don't assume that weather conditions are static. Looking at the locations of the Pilot to Forecaster stations throughout the US in the Enroute Supplement, it's hard to imagine a pilot that is very far away from a weather station. It was rather obvious from the conversation between the pilots who were talking to the forecaster at my friend's destination, that they were extremely surprised by the 500 feet and heavy rain. Let's avoid surprise like this and know what the weather is before arriving at the IAF.

* * *

Placed in a conspicuous spot in a base operations we recently visited was something which might be of some interest to other base ops troops. In a neatly arranged display board were two sets of envelopes. One contained HR forms with the address of the safety office printed on the outside of the envelope. In the other stack of envelopes was a space for an "Any Gripe" report. In other words anything that anyone felt should be brought to the attention of the safety office has a straight channel. The name of the submitter was optional. This seems like a real good idea to us. Some gripes are not of the HR breed but are simply something that should be brought to the attention of a responsible individual. Nice work, Kelly. Anyone else have ideas that might improve the transient services?

THE

REX RILEY

Transient Services Awara

LORING AFB	Limestone, Me.
McCLELLAN AFB	Sacramento, Calif.
MAXWELL AFB	Montgomery, Ala.
HAMILTON AFB	Ignacio, Calif.
SCOTT AFB	Belleville, Ill.
RAMEY AFB	Puerto Rico
McCHORD AFB	Tacoma, Wash.
MYRTLE BEACH AFB	Myrtle Beach, S.C.
EGLIN AFB	Valparaiso, Fla.
FORBES AFB	Topeka, Kans.
MATHER AFB	Sacramento, Calif.
LAJES FIELD	Azores
SHEPPARD AFB	Wichita Falls, Tex.
MARCH AFB	Riverside, Calif.
GRISSOM AFB	Peru, Ind.
CANNON AFB	Clovis, N.M.
LUKE AFB	Phoenix, Ariz.
RANDOLPH AFB	San Antonio, Tex.
ROBINS AFB	Warner Robins, Ga.
TINKER AFB	Oklahoma City, Okla.
HILL AFB	Ogden, Utah
YOKOTA AB	Japan
SEYMOUR JOHNSON AFB	Goldsboro, N.C.
ENGLAND AFB	Alexandria, La.
KADENA AB	Okinawa
ELMENDORF AFB	Alaska
PETERSON FIELD	Colorado Springs, Colo
RAMSTEIN AB	Germany
SHAW AFB	Sumter, S.C.
LITTLE ROCK AFB	Jacksonville, Ark.
TORREJON AB	Spain
TYNDALL AFB	Panama City, Fla.
OFFUTT AFB	Omaha, Nebr.
McCONNELL AFB	Wichita, Kans.
NORTON AFB	San Bernardino, Calif.
BARKSDALE AFB	Shreveport, La.
KIRTLAND AFB	Albuquerque, N.M.
BUCKLEY ANG BASE	Aurora, Colo.
RICHARDS-GEBAUR AFB	Grandview, Mo.

Toots

is interested in your problems. She spends t time researching questions about Tech Orde and directives. Write her c/o Editor, Aerospa Safety Magazine, AFISC, Norton AFB, CA. 924







The other day I was looking for an item in Tech Topics and it struck me that many of those briefs that appear in the magazine each month describe the causes of accidents that for some reason didn't happen.

Like the brief in April about a stuck throttle in a T-37. Lack of safety wire allowed the throttle linkage to disconnect.

Or the one in March about the F-4E with a jammed control stick. Somebody left a bolt in the rear cockpit stick well.

Then there was the one about an F-100 with hydraulic system failure. The bird got dinged when the hook failed to catch the barrier cable. But the whole thing was caused by a hose of improper length, which caused chafing and eventual failure. We told you about that one in September.

It was hot in July but not as hot as the bearing rollers that fused the retaining nut to the axle on the right wheel of a C-123. Somebody left off the wheel retaining nut safety bolt.

Did you see the one in June about the F-4 in which there was an explosion during GCA low approach? After a single engine landing it was found that the left engine had eaten a bolt. Another was found in the engine bay. They were engine mounting bolts that sheared because they had been damaged during installation.

These are just random samples from hundreds of like cases. When you take the time to read all those published over the period of, say, a year, it scares you. Especially when you consider that the items published are only a fraction of the total.

1971 was a very good year. The Air Force had the fewest accidents in its history. So somebody was doing something right. Like you maintenance types. You did a great job, and you deserve credit.

Nevertheless, there were many reports of maintenance malpractice, some of them with very serious results. I think we can do better. Why not shoot for a whole year without a single accident caused by maintenance?

Imagine what that would mean, if we can do it!

Toots

Dear Toots

Para 6-2c, TO 4T-1-3 requires tires and wheels be initially inflated inside an inflation cage. The tires we have pre-positioned at our overseas base were built up at a stateside base, leak checked, deflated to 20 psi and shipped to our station.

My question—Is it safe and legal to inflate our pre-positioned tires not utilizing an inflation cage?

Confused Captain

Dear Confused

The tire and wheel assembly does not have to be placed in the inflation cage for reservicing to operational pressure. However, should you have any reason to believe that an assembly may have been damaged in shipment, it would be wise to use the cage. The way we look at it is that the cage was provided for your protection. You can't go wrong using it.

Toots

Dear Toots

I have a question concerning the use of the AF Form 124A, Publications and Forms Requisition. Some individuals in my shop say that this form can be used to requisition tech orders at base level, and I say it cannot. Please clarify this subject. Does a base have the authority to supplement AFM 7-2 to include the use of this form at base level for requisitioning tech orders? What reference says if this can or cannot be done?

SSgt George A. Rudy
Edwards AFB, Calif.



Dear George

AFM 7-1 states that AF Form 124 and 124A are used to requisition publications and forms other than TO's. I know of no command supplement that authorizes its use to request tech orders. AFM 7-1, para 75, refers you to TO 00-5-2 to submit your technical order requirements.

Toots

Dear Toots

Although I have no problems to write to you at this time, I would like to congratulate you on the fine article in the December issue—The Responsibility for Accurate Technical Data. This is the only way to have sound procedures and top notch aircraft maintenance. I enjoy your articles. Keep up the fine work.

SMSgt David Segura
Det 1, 150 Tac Ftr Gp, ANG
Albuquerque, New Mexico

Thanks for writing, Dave. You are absolutely right about tech data, and top notch maintenance is the only kind we can afford.

Toots

QUOTE OF NOTE

"Patriotism is one of those ideas that is hard to pin down. Like leadership—if you attempt to define it—you put a fence around it—limit its scope—it is much too complex to be imprisoned in words. But to understand it is to remember that patriotism is a love—a love of country—and love is something we all can grasp. It is for richer—for poorer—in good times and in bad—it is loyalty that develops an attitude to serve—to sacrifice—even your life—to protect honor and country. That is what patriotism is all about."

General Jack J. Catton, Commander, Military Airlift Command
Washington, D.C., 19 September 1971.

Tech

pulling the streamer is a no-no!

The B-52's bomb release lights indicated all bombs had released. The remainder of the mission and the return to base were uneventful.

During postflight inspection, the aircrew discovered that three of the M-117 bombs were still aboard. A closer inspection revealed that bomb station 19 had released onto the safety pin. The red streamer was missing from the pin and the pin had not been removed! The bombs at station 23 and 27 had released and were piggy back on station 19!

This aircraft had been a spare, so the safety pins were not removed during normal preflight. When the crew was required to launch to replace another aircraft, the individual removing the pins pulled the streamer, which separated from the pin.

All unit personnel have been briefed that even though only minimum time is available, safety pins will not be removed by pulling the streamer. The pins will also be counted to insure that the correct number has been removed.

he blew it

The crew chief of an O-2A removed the front engine cowling and placed it on the ramp two feet in front of the engine. Later an engine run-up was necessary so the crew chief climbed aboard, started the engine and . . . you guessed it. The cowling was drawn into the prop. The cowling was destroyed and the prop had to be changed.

Inexperienced man? Not hardly. This individual had more than ten years experience in the aircraft maintenance field.

chocks alone won't do it

Chocks alone will not hold an aircraft at high power settings. An F-106 recently proved this when it made a speedy exit from a shelter during engine run.

The weapons system was being operationally checked following depot modification. The armament personnel notified the APG lead man that they were ready for engine run to check out the loop resistance. The lead man climbed aboard, started the engine and stabilized RPM at idle while the armament personnel completed their checks.

At this time another individual, who was checking out the shelter exhaust silencer, handed the operator a note requesting that he advance power to bring the silencer temperature up to 200 degrees. As power was advanced the aircraft jumped the chocks, exited the shelter, struck a wooden trailer with the left wing and came to a skidding stop in front of another aircraft.

Looking back over what led up to this incident, we find that the aircraft had been secured for engine run earlier in the day, bridle connected and steel chocks in place. However, the bridle and steel chocks had been removed and replaced with wood chocks to get a work stand in place. The operator was not on the brakes during the engine run, as he had not given instructions for the bridle and steel chocks to be removed and he thought the aircraft was properly secured for high power settings.

Regardless of **prior** status of an aircraft, a quick check of the forms and a walk around before engine start is essential, as this mishap indicates.

COMMANDERS: *Do you know that approved procedures are being followed in your unit?—RO.*

T-bird gear problem

After an hour of pilot familiarization flight and three normal patterns, the T-Bird IP noticed a nose gear unsafe indication and the approach was discontinued.

All attempts failed to help the situation. A chase plane reported that the mains were down and locked but the nose was up with the doors open about two inches. When fuel was depleted to 70 gallons, the T-Bird was landed on a dry lake bed.

The problem was traced to the nose gear up line restrictor orifice. A piece of red plastic was lodged in the orifice preventing return fluid flow from the actuator. Investigators were unable to discover where the plastic came from, but one thing's sure: it didn't get there by itself.

topics

BRIEFS FOR MAINTENANCE TECHS

you got it, George-George

The T-38 was number two in a formation takeoff. The student experienced a slight pitchup, and the IP took control. Thinking the student had induced the pitchup, he raised the gear and flaps and continued the mission.

Later in the flight, as the gear and flaps were lowered, the aircraft again pitched up—as expected with flap/stabilizer interconnect failure. The mission was terminated with a no-flap landing.

The cause was maintenance: The forward end of the flap/slab interconnect cable was not connected to the actuator bell crank. The attaching bolt was in the cable end (where it is sometimes placed during boattail removal.)

This incident resulted from a chain of events reflecting a gross absence of professionalism. The maintenance crew didn't connect the cable during boattail (aft section) installation and also failed to perform the operational check required by the TO. The supervisor who cleared the red cross failed to note the discrepancy. The ground and flight crews both missed the discrepancy during the before-launch check. The last chance crew also failed to notice the improper position of the slab.

This looks like a classic case of letting George do it—and George being away for the day.

proper B nut maintenance

After 1.3 hours of flight a main transmission oil leak was discovered on the HH-3E. The initial spray type leak soon developed into a large stream. The pilot made an emergency autorational descent to a safe landing on a grass field.

The cause: an overtorqued B nut. A leak had been reported at this fitting prior to the flight. The corrective action was to tighten the B nut; however, the B nut was obviously overtorqued, which led to inflight failure.

If you have a leaky fitting, extra tightening is not the answer. Look for the reason; remove and examine the sealing surface for damage in the form of scratches, nicks, burrs, or cracks. Also don't overlook foreign material. Examine the threads of the nut for damage. A false torque reading can be obtained if damage is present.

During any maintenance operation, take a good, hard look at the B nuts. If any impending maintenance or materiel failure can be detected and corrected, the reliability of the entire system will be increased.

HH-43 lost door

Thirty minutes into the training flight of the HH-43B, the pilot heard a loud thump while turning to base leg and immediately selected a landing site. As the turn was completed, the pilot saw the copilot's door flutter to the ground. Landing was accomplished without further incident.

Inspection of the aircraft revealed that the door had hit the inboard vertical stabilizer as it left the helicopter.

Maintenance bought this one. Five days prior to this incident maintenance had removed the copilot's door. During removal the mechanic had reinstalled the fore and aft door blocks upside down to prevent loss of blocks and screws while the door was off. Unfortunately, during reinstallation of the door the mechanic failed to notice the improper position of the blocks. The helicopter flew 5.6 hours prior to loss of the door.

It should be emphasized here that when parts, nuts, bolts and washers are removed, they should be placed in suitable parts bags and properly identified. They should never be installed improperly, even for safekeeping.

a bad bargain

Two flightline types, a MSgt and SSgt were working on a T-33 canopy actuator. As work progressed, the MSgt decided that, to complete the job, the front seat would have to be removed. He had previously installed some of the safety pins and disconnected the quick disconnects.

After the MSgt removed the thruster bolt in preparation for

Tech topics

BRIEFS FOR MAINTENANCE TECHS

seat removal, he called maintenance control and requested egress personnel to remove the seat. They were dispatched but the MSgt became impatient after about five minutes and decided to go ahead with the seat removal himself. When the seat was raised about four or five inches the M-32 initiator fired, activating the lap belt release and rotary actuator.

The safety pin had not been installed in the initiator nor was the trip linkage disconnected.

We have highly trained and specialized personnel to do specialized work. This MSgt knew the right procedures but failed to wait for the egress personnel to do the job they were trained for. Compare the few minutes the MSgt was trying to save with the time required to correct his mistake.

F-111 fod

When the F-111's gear was retracted after takeoff, the unsafe warning light stayed on. The emergency checklist was initiated. The utility hydraulic isolation switch was positioned to "pressurize" and at this time the crew felt a thump as if the gear were cycling. The warning lamp remained on. A visual inspection by a second aircraft revealed that the gear was up and the doors closed. The gear was then extended with the normal system and all three indicated down and locked. A successful full stop landing followed.

The cause: foreign object. A bolt was lodged between the main gear up lock actuator rod end and the gear beam. This prevented the uplock linkage from reaching the overcenter when the hook was in the open position.

must reading for maintainers

A maintenance goof cost the Air Force several hundred dollars, and if the pilot hadn't been sharp there could have been a much more costly accident.

After takeoff the T-39 gear handle was raised and the crew observed a steady red light in the gear handle. Gear handle was lowered and indications showed the main gear down and locked, but the nose gear was unsafe. As a possible solution to free the nose gear, an attempt was made to engage the main nose wheel steering system. As expected, this system would not engage without the aircraft weight on the main gears. However, the standby nose wheel steering system operated when airborne, due to a faulty ground electrical relay. Thus, when the pilot moved the nose gear steering switch to standby, the nose gear steering green light came on. Subsequent rudder movement apparently dislodged the nose wheel and the gear extended, but was cocked 30 degrees to the right. On touchdown the pilot held the nose off as long as he could but when elevator control was lost, the nose gear touched down and the bird veered right and went off the runway.

The problem was caused by sloppy maintenance. Somebody repacked the nose gear strut and during reassembly the lower bearing slipped back from the keys on the barrel assembly. The mech didn't notice it and when he torqued the gland nut, the barrel assembly rotated, which secured the inner bearing 30 degrees left. This forced rotation of the gear to the right and it stuck in the well on retraction.

The TO calls for jacking during strut servicing and a retraction check. When the strut was serviced the aircraft was not jacked and consequently no retraction check was accomplished.

Surely we can do better.

COMMANDERS: *Are you aware that misuse or non-use of tech data is a common write-up by UEI teams? Is your organization guilty?—RO.*

pintle hooks

Who would think that a simple-looking pintle hook on the back of your vehicle could cause problems. It has and it does. A recent incident indicates that we still have some pintle hooks that have not been properly modified in accordance with TO 36-1-44.

A sergeant was dispatched to pick up a trailer load of MK-82 bombs and deliver them to the storage area. Enroute the trailer got loose and took off on its own. During investigation of this incident it was discovered that the safety pin hole had been drilled

in the wrong location. The hole had been drilled to within one-eighth inch of the bottom edge of the trip lock. This allowed the trip lock to be inadvertently pinned in the unlocked position.

TO 36-1-44, para 1-A states that it is the responsibility of the maintenance officer to assure that the hole is correctly line drilled through the upper jaw and latch of the hook. It might be wise for you maintenance officers to review TO 36-1-44, then take a look at the pintle hooks installed on your vehicles. Another point to keep in mind is lubrication; excessive lubrication combined with dirt and grit will prevent the upper jaw locking spring from properly seating the lock device.

T-29 torque problem

The T-29 was cruising at 16,000 feet when the number two DC generator failure light, the alternator-generator (AG) low pressure light, and the alternator failure light came on.

The number two DC generator and the alternator were turned off, the AG system was shut off, and the electrical load was reduced. The navigator reported fluid leaking from number two nacelle.

During descent, the navigator reported smoke coming from the number two augmentor tubes, and the engine was shut down.

Cause—the "B" nut on the alternator hydraulic pump pressure line, at the fire wall quick disconnect fitting, had not been properly torqued during build-up, permitting it to loosen during flight.

tires

A recent UEI at one of our bases turned up several discrepancies in the tire change/tire service area:

- During a 28-day period, 34 tires were replaced for cuts. Of those 34, 25 were found to be still within safe limits. Further investigation revealed that only three tire cut depth gages were available in the entire wing!

- During the same 28-day period, 63 tires were replaced for excessive wear. In 80 percent of these, the wear was caused by under-inflation. Deeper digging by the team turned up the fact that the air compressor in the tire shop was redlined at 250 psi—while tires on the unit aircraft required 265-280 psi for proper inflation. At the squadron level, not enough pressure gages were available. Of the ten gages assigned to one squadron, six were unserviceable; of 11 assigned to another squadron, eight had been in the PMEL lab for more than a week.

It's hard to believe that anyone would try to maintain a space-age weapons system with barnstormer equipment. You can't do the job without proper tools. If you don't have 'em, get 'em.

COMMANDERS: *Are you using* your *tools to make sure your people have the ones* they *need?—RO.*

wanted-supervisor

The C-118 was cruising at 12,000 feet when the pilot felt a slight jar. He looked out and saw that the entire ring cowl from number one engine was missing.

Several people were at fault in this one. First, the maintenance team at a transient base attempted to remove the cowling to correct an inflight discrepancy. They loosened some of the camlocks but were unable to remove the cowling. After their attempts to remove the cowl failed, they neglected to tighten the camlocks and also failed to make any form entries as required by tech data.

No direct supervision was available to the maintenance team even though it was known they were not familiar with this type aircraft.

The flight engineer also failed to inspect the cowling for security, although he had been informed that inexperienced personnel had attempted to remove it.

Good supervision is the key to successful aircraft maintenance. Sound supervision and diligent use of tech data would have prevented this incident.

COMMANDERS: *What instructions have you given to* your *flight engineers to insure that proper supervision* is *available in case maintenance is required at a transient base? Does your Transient Maintenance have the tech data they need to do their job? Do they use it?—RO.*

EXPLOSIVES SAFETY

INADVERTENT FIRING

The F-4 returned from a range mission with three BDU-33 practice bombs still on board and one 2.75-inch rocket left in the SUU-20, and the load crew was dispatched to dearm the aircraft. When dearming was completed, the aircraft taxied back to the parking ramp, where the same crew downloaded the bird.

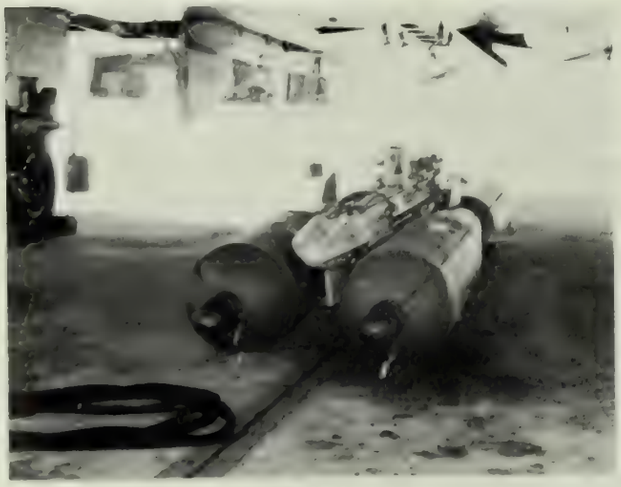
Twenty-five minutes later the crew was again called out, this time to upload another aircraft—but the job was never completed. As part of the load for the second airplane, they used the stores they had earlier downloaded. And while performing a continuity check on the SUU-20, the 2.75-inch rocket, *which had never been removed from the pod,* fired.

The result? One airman suffered burns and laceration to the right arm and shoulder—and his left eye was so badly damaged that it had to be removed.

The cause? Failure to follow TO procedures, of course.

THE RESPONSIBLE CREW CHIEF

A crew chief has one of the most responsible jobs in the Air Force. He can seldom afford to be wrong, since lives and equipment are usually at stake in any action he takes. Although no lives were lost in the mishap to be described, the cost was more than $8,500 and there was a potential danger to human life.



The crew was dispatched to load CBU-24s on an aircraft in the fast turn area. The crew chief sent a sub crew of two men from his team to remove impulse cartridges from the aircraft's previous load while he completed the post load check on the previous load.

When the chief arrived to start aircraft preparation for the load, the sub crew informed him that all impulse cartridges had been removed. However, during functional check of the centerline Aero 27 rack, two impulse cartridges fired, jettisoning the centerline MER with four fuzed CBU-24s to the ramp. Although the sub crew was cited as contributors to this incident because they failed to remove all the cartridges, the crew chief bought this one because he failed to *insure* that all impulse cartridges had been removed, as called for by the TO.

COMMANDERS: *Are your supervisors fully aware of their responsibilities, both those inherent in the job and as directed by tech data?—RO*

CONVERSION OF STOPPING DISTANCE MEASURING EQUIPMENT USED INTERNATIONALLY

FIGURE 3

MU-METER	JAMES BRAKING DECELEROMETER (RCR*)	STOPPING DISTANCE RATIO	TAPLEY* METER	SKID* METER	MOTNE CODE	VERBAL CODE
.7	23.5	1-1	.70	.70	5	good
.65	21	1.2-1	.65	.65	5	good
.60	19.3	1.3-1	.60	.60	5	good
.55	17.7	1.4-1	.55	.55	5	good
.50	16.1	1.5-1	.50	.50	5	good
.45	14.5	1.65-1	.45	.45	5	good
.40	12.9	1.8-1	.40	.40	5	good
.375	12	1.9-1	.375	.375	4	medium-good
.35	11.3	2.0-1	.35	.35		
.325	10.5	2.1-1	.325	.325	3	medium
.30	9.65	2.2-1	.30	.30		
.275	8.8	2.4-1	.275	.275	2	medium-poor
.25	8.05	2.6-1	.25	.25	1	poor
.20	6.45	3-1	.20	.20	1	poor
.15	4.8	3.5-1	.15	.15	1	poor
.10	3.22	4.1-1	.10	.10	1	poor
.05	1.6	6-1	.05	.05	1	poor
0	0	00-1	0	0	1	poor

*used on snow and ice only

WHOA WOES *continued from page 3*

and NASA, is evaluating two systems for wet runway evaluation, the Mu-meter and the diagonal braking vehicle. Both of these systems have had some success in providing a runway surface input to the stopping distance formula for aircraft.

There are three other systems in use that are adequate on snow and ice but are not valid on wet runways. These are the James Braking Decelerometer, the Tapely meter and the Skid-meter. These systems are basically the same. All three are horizontal "G" meters that measure maximum G developed in a stop. The Tapely meter and the Skid-meter read in coefficient of friction, and the JBD reads rate of velocity change, or deceleration in feet per sec/sec.

There are two codes used throughout Europe that may cause some misunderstanding for the uninitiated. They are the verbal code, and the Motne code. To understand the verbal and Motne code relationship to RCR carefully review Figure 3. Keep in mind, a braking action of "good," using this code, can be misleading.

ANTI-SKID

Anti-skid systems have been developed that are excellent for preventing locked wheel skids on dry runways. These same systems, however, can cause trouble on wet runways. Anti-skid systems *became very important* with the development of power boosted brakes. With some aircraft it was almost humanly impossible to detect a skid in time to prevent tire failure. Anti-skid systems, however, would apply braking pressure until the tire would start to slip, then decrease the pressure slightly and gently reapply it. This would continue until the aircraft came to a stop. On dry runways the systems worked great.

On wet runways less brake pressure was required to cause a slip, and a decrease in pressure might not permit the tire to spin up. The anti-skid systems decreased pressure as a function of time. The ingredient left out of the formula was the tire spinup time required under all conditions. This is an essential ingredient because the cornering force, or the side force capability, is dependent upon the wheel rolling. The tire could enter, say, a 25 percent slip and brake pressure would decrease to allow the wheel to spinup, but the spinup was not complete before pressure was reapplied. The sensing element would recompute a 25 percent slip based on the speed of the wheel at the second brake application instead of the speed of the aircraft. After four or five such applications the wheel may come to a complete stop, not spin up and the anti-skid system, which cuts out below 15 or 20 knots, thinks the aircraft is parked in the dearm area, when, in reality, the aircraft is speeding down the runway at 85 knots or so.

In an effort to prevent locked wheels at low coefficients of friction the newer anti-skid systems sense skids at lower brake pressures and, rather than decrease brake pressure, release pressure to zero to permit spin-

up. If the spinup is slow, however, the same succession of applications and releases that was characteristic of older systems can occur, and with the same results.

Cornering force is necessary to maintain control of the aircraft on the ground. *When a tire is in a locked wheel skid it has no cornering force.* It must be stressed that with lower coefficients of friction, a total skid is not required to eliminate side force capability. NASA research has shown that with an RCR of 8, a 25 percent slip ratio would result in essentially zero cornering ability. This 25 percent is significant because that is the point at which many anti-skid systems release or decrease brake pressure. If, at the time the anti-skid system cycles, the aircraft goes into a side slip, spinup is again impaired. As side force capability is decreased with rotational skids, forces available for spinup are decreased with side skids.

CROSSWINDS

We repeat—*"When an aircraft wheel is locked in a skid it has no cornering force."* If hydroplaning occurs, or if the brakes lock up due to low coefficients of friction, use of rudder will very effectively change the direction the aircraft is *pointing*. However, if no cornering force is available on the tires, use of rudder alone will not change the direction the aircraft is *going*. If other controls are not available, and a crosswind exists, the aircraft can be expected to depart the runway at a rate roughly equal to the crosswind component. Aerodynamic controls alone, under these conditions, cannot keep an aircraft on the runway. When all tires are totally dynamic hydroplaning, crabbing on the runway will provide a thrust vector, and perhaps sustain you long enough to go around or snag the approach end arresting gear, if you're lucky enough to have both a hook and a compatible arresting system.

Under slippery runway conditions, a skid must be broken the same way you do in a car. That's not easy considering that the aerodynamic control first used to turn the airplane back to the original track on the runway is usually the rudder. It would be desirable to have a nose wheel that would at all times stay aligned with the runway regardless of which way the aircraft is pointing.

NASA researchers have stated that on a typical wet runway surface a tire will lose its cornering ability when a side slip of more than 13 degrees is exceeded. A problem in controlling aircraft on wet runways is that, by the time you realize you are in trouble, this 13 degree side slip may be exceeded.

McDonnell-Douglas is addressing this problem in the F-15 by adding a limited authority, full-time nose wheel steering system. This system will turn only 15 degrees either side of centerline. The nose wheel will not steer until the nose strut is compressed; if the pilot has demanded rudder control, the nose wheel will slowly align itself with the rudder position. As pressure is built up in the system it will steer as demanded but only to ± 15 degrees. Pilots will probably not know whether the correction is from rudder effectiveness or from nose wheel steering. It's not important where the control is from if control is maintained. This system does provide nose wheel steering for control on wet runways for aircraft that steer through the rudder pedals, and does so without abrupt or excessive nose wheel steering changes. In aircraft with nose wheel steering wheels, this problem is not so acute, but it must be remembered that excessive angles or abrupt changes can induce skids when you don't very much need them.

SUMMARY

When a total dynamic hydroplaning condition exists, control is almost impossible. Braking is nil. And the ability of many "good" pilots to stay out of trouble is questionable. Even at speeds below total dynamic hydroplaning speed, the relative slipperiness of the runway, combined with a partial dynamic hydroplaning condition, can result in loss of braking effectiveness. Control problems should then be expected and alternate courses of action considered. Under some conditions a go-around or an approach end engagement may be the *only* alternatives.

In moderate to heavy rain it is common for standing water to exceed the depth necessary for dynamic hydroplaning. Snow and ice are slick and can cause serious control and braking problems. If snow and ice are to be melted by use of a thawing agent, drainage is essential or a hydroplaning pool may be formed on the runway.

Nose wheel steering is a valuable aid but abrupt control changes or excessive angles will cause loss of cornering ability.

There are so many variables in the interaction between an aircraft tire and a runway that a system to predict absolute performance is still a long way down the road. Ball park figures are the best you can expect. As has been said, the only way to really tell F-4 performance on a particular wet runway is to fling it down the runway and see if it floats. It has been decided that being prepared for the worst and knowing the alternatives available is a better method. ★



NUCLEAR SAFETY AID STATION



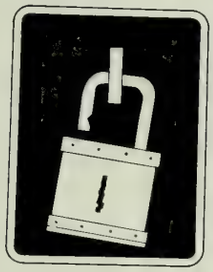
POLICEMAN, DON'T RATTLE THAT DOOR!

Remember in the local neighborhood how the iendly policeman would check stores by turning e doorknob and rattling the door? However, when pplied to US Air Force Weapons Systems, this prac-ce can cause problems. Recently, at a missile unch shelter, the shelter doors appeared to be ghtly ajar. Security alert team (SAT) personnel newed the policemen's habit by pushing and pull-g on the shelter doors to reset the alarm. In tempting to shut the doors the lock became un-tched. One SAT member entered the shelter alone, shed the sliding door, and exited through the per-nnel door. An accident/incident/deficiency (AID), ll Sword, involving violation of the Two-Man Policy s submitted. Investigation led to improved main-nance procedures, stenciled door operating instruc-ns, and improved training procedures. Rattling the or is no substitute for proper safety procedures.



HAPPINESS IS— AIDS THAT INFORM

The accident/incident/deficiency (AID) report, particularly the Dull Sword, is frequently received incomplete, not because the information is not available but because it is not included. A recent Dull Sword involved the application of excessive power (about three times the proper voltage) to a nuclear-weapon-loaded aircraft. The AID report gave a detailed account of why the power was applied but contained neither information concerning tests on the aircraft armament circuitry and weapon test nor test results. When an AID could affect monitor, control, and release circuitry, or cause a weapon malfunction, a report with complete, detailed, factual information, including test results, is an absolute requirement. To prevent wrong assumptions, and perhaps panic telephone calls and messages, be sure your AID report is complete, particularly when weapons are directly involved.



FALSE SECURITY

Unauthorized entry into your special ammunition storage area should trigger a security alarm through the intrusion detection alarm system. Will it register an alarm if the activating circuitry or electrical power is interrupted? A recent report indicates that at one location the circuitry could be disconnected or the power removed without resulting in a security alarm. As simple a thing as cutting a wire at any one of the several locations could eliminate the alarm system. If your system is not fail safe, you are suffering from a false sense of security. A simple test will tell you.

job control

maintenance nerve center

CMSgt JACKIE L. SMART, 63d Hq Sq, Norton AFB, Calif.

There is a duty section in all aircraft maintenance organizations that can be compared to the transmission in your car. We know it is there; we know we must have it in order to operate satisfactorily. Yet few of us actually look at it or know just how it performs its task. This section is called, depending on what command you're in, Job Control or Workload Control. Perhaps this article will give you an idea of what is done and why it must be done in order for our aircraft to fly.

Job Control is sometimes referred to as the "Nerve Center" of the aircraft maintenance complex and, in actuality, it is just that. Its function is to control all maintenance on all aircraft, twenty-four hours per day, seven days per week. Exactly how it goes about this function varies from command to command but basically they all perform the same tasks. The number of personnel required to operate a job control section also varies as to skill levels required. This article is being written with a Job Control in the Military Airlift Command as a guide.

When you first enter Job Control you must stop for a few seconds while your eyes become adjusted to the darkened room. As you regain your vision you see several men sitting at dimly lighted control boards throughout the room. Each man wears a headset and you can hear several one-way conversations being carried on at one time. Each man seems to operate independently and yet they are all working toward the same end result: *Get the aircraft repaired and airborne on time.* To dispel your immediate impression of organized confusion, let's take a typical aircraft on a typical scheduled mission and see what happens.

At approximately 1500 hours the Senior Controller receives tomorrow's flying schedule from Plans and Scheduling. Aircraft No. 666 is scheduled to depart at 0100 hours tomorrow morning. To make things less complicated, let's say 666 is already in commission and remains so until shortly before the flight crew is scheduled to arrive at the aircraft.

At 2130 the aircraft controller receives a call on his radio from the flight chief stating, "666 has a hydraulic leak on number four brake and the number two UHF is inoperative." The aircraft controller initiates a work order on an AFTO Form 349 for each of the discrepancies and gives the job numbers to the flight chief. He then passes the UHF work order to the Avionics Maintenance Squadron (AMS) controller and the hydraulic leak work order to the Field Maintenance Squadron (FMS) controller. He enters both discrepancies on the aircraft "slat" on his control board and instructs the Aerospace Ground Equipment (AGE) controller to dispatch a jack to 666, in case it is needed for a brake change. He now makes certain that the Senior Controller is fully aware of the problems and what he has done to correct them.

Meanwhile, the AMS Controller has called the UHF work order to the radio shop on his hot line and has instructed the AGE controller to dispatch a vehicle to pick up the specialist at the shop and deliver him to 666. He then plots the work order on his specialist control board and informs the aircraft controller that he has dispatched the specialist.

At the same time, the FMS controller has called the hydraulic shop and the wheel and tire shop on his hot line and has given them the work order on the hydraulic leak. He also plots the work order on his specialist control board and informs the aircraft controller that he has dispatched specialists to cover the job.

The AGE controller notifies the AGE branch by radio to deliver a jack to 666 and to accomplish the specialist pickup and delivery. He repositions a magnetized tab which represents an aircraft jack on his AGE control board to show the exact location of the jack.

The aircraft controller is kept informed by radio on the progress and problems encountered with the discrepancies on 666. Every discrep



TSgt Gary R. Jones, Field Maintenance Specialist Controller, plots a work order that has just been given to one of the shops under his control.



TSgt Virgil V. Vess, Senior Controller, maintains current status of all aircraft on the base. The Senior Controller is the number one "decision maker" in the maintenance control complex.



Sgt Don Jenkins, Aerospace Ground Equipment Controller, sets up a parking spot for an inbound aircraft.



SSgt Maynard Roderick, C-141 Aircraft Controller, placing a call to base supply to check on the status of a needed part.



MSgt Ernest P. Pollard, C-141 Aircraft Scheduler, plans next week's flying and pre-plan maintenance schedule.

ancy must be closely monitored from call-in to completion.

The Senior Controller has observed all that has taken place and has kept the Airlift Command Post informed of the problems and progress.

At 2245 both jobs are called in as "completed" and all the controllers' paperwork is closed out and the control boards wiped clean of the two discrepancies. The flight crew completes their preflight inspection and launches on time.

This has been a greatly simplified example of how an unscheduled job is handled by the personnel in Job Control. Multiply this example by 30 or 40 aircraft and add literally hundreds of scheduled work orders and you can readily understand that this is no easy task but that it is a job that must be done. Job Control personnel establish all work priorities and monitor supply delivery priorities. This effort minimizes the peaks and valleys that would otherwise occur and produces a smooth workload flow.

The men assigned to Job Control must be highly qualified, dedicated individuals who can consistently perform under pressure. They must be willing to work varied shifts, including weekends and holidays. In short, they must be "professionals." ★



MAIL CALL

ground effect

In the December 1971 issue, the two polars in the "Ground Effect" article have been mislabeled. The "out of ground effect" legend has been attached to the "in ground effect" C_l vs. C_d data, and *vice versa.*

PETER W. YOUNG
395 Strat Msl Sq
Vandenberg AFB, Calif.

You're right. We contacted the engineers at Northrop and they confirmed the transposition in the legend. Thanks for your sharp observation.

more magazines

I recently surveyed the units in my wing and found out that one squadron was on the mailing list for one copy of your fine magazine. Since this made me a bit suspicious, I checked a bit deeper and found that they were only getting one copy of the command magazine and one Driver magazine. All these publications provide excellent accident prevention material and should be available to everyone. Wonder how many other units are in this shape?

Concerned Wing Safety Officer

We wonder, too. Maybe all squadrons should be surveyed and the PDOs contacted if too few copies are available.

tire pressure checks

I look forward each month to reading *Aerospace Safety*. There are usually several articles of special interest to me as a Depot Quality Assurance Specialist. One such article was "The Primary Cause—You," in the December 1971 issue, which reported a tire that was found to be 90 pounds low. I receive many Quality Unsatisfactory Materiel Reports (QUMRs) each month reporting tubeless tires to be leaking through the sidewall vent holes. Th only purpose of these vent holes i the sidewall of any tire is to releas air that normally diffuses throug the liner. Since we know a certai amount of diffusion will be occur ring constantly, the periodic tir pressure checks cannot be over emphasized.

Many tire QUMRs have been sub mitted reporting tires that checke satisfactorily on initial leak check but became excessive after 15 to 2 landings. The contractor's investiga tion indicated the tires had bee operated in an under-inflated condi tion causing damage to the line with resultant excessive air los through the vent holes. Fortunately these tires were removed prior t the loss of the aircraft, but the po tential is still there. To my know edge, none of these reports ha been traced back to the responsibl person not having a tire gage, bu they indicate that the gage was avai able but not properly used.

R. C. CROUCH
OOAMA (MMMQ
Hill AFB, Utah

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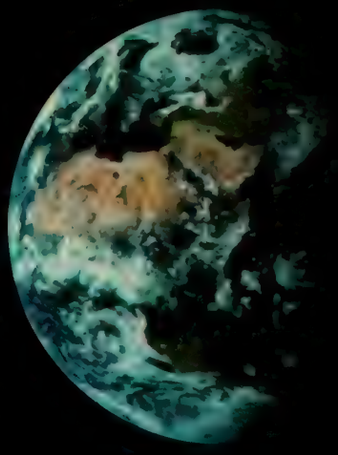
Captain
PATRICK W. MULDOON

3d Tactical Fighter Wing, APO San Francisco 96264

On 31 March 1971, Captain Muldoon was piloting an F-4D aircraft on a night air-to-ground gunnery mission, when some flares hung up. Returning to base, Captain Muldoon heard a muffled explosion in the rear cockpit, immediately followed by a severe pitch down, left roll, and right yaw. He immediately depressed the paddle switch, thereby disengaging the stability augmentation system and eliminating the associated transients. The aircraft was quickly returned to level flight. The cockpit then rapidly filled with dense smoke, and fire was evident beneath the rear cockpit ejection seat. Captain Muldoon turned the generator switches off, selected one hundred percent oxygen, notified his Weapons System Operator to do the same, and pulled the emergency vent knob. The fire ceased and the smoke cleared from the cockpit. All unessential electrical equipment was turned off, and the ram air turbine auxiliary generator was extended. No fire was evident under these conditions.

Captain Muldoon directed his wingman to take the lead for a GCA approach to the field and declared an emergency with the control tower. However, due to extreme difficulty in controlling the aircraft in formation at 250 knots and below, the approach was discontinued. Captain Muldoon elected to make a single ship approach and a no-flap landing to maintain an airspeed for best controllability and to prevent the possibility of asymmetric flap extension. The landing gear was blown down with the emergency extension system, necessitated by the lack of electrical power to the landing gear control. The hook was lowered on final approach, and an approach end arrestment was made.

Captain Muldoon's assessment of the situation and ability to properly accomplish the corrective actions for several different emergencies make the recovery of the aircraft without further incident a truly outstanding feat of airmanship. WELL DONE! ★



In *this* world
the United States Air Force
leads the way
in aircraft accident prevention

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Aerospace SAFETY



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UNITED STATES AIR FORCE **MARCH 1972**

Aerospace SAFETY

FOR AIRCREWS, MAINTENANCE & SUPPORT TECHNICIANS

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DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

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MARCH 1972 AFRP 127-2 VOLUME 28 NUMBER 3

MAJ RICHARD E. HAMILTON, DIRECTORATE OF AEROSPACE SAFETY

THE COMMANDER'S GOT TO GET INVOLVED

Although the record shows that maintenance is the primary cause in only 6-7 per cent of all USAF aircraft accidents, poor maintenance practices definitely contributed to many of last year's accidents which were tagged with operator factor or materiel failure as primary cause! There were far, far too many cases where the "remove and replace" syndrome was substituted for trouble-shooting the system, work was signed off without actually being inspected, or discrepancies were cleared by "could not duplicate" or "checked IAW. . ."

In one recent major accident, the aircraft maintenance history revealed that repeat write-ups on three separate systems had occurred seven times in one month. Corrective actions consisted of "could not duplicate," "removed and replaced unit," and "checked within tolerances IAW . . ." Incidentally, one of the repeat write-up items failed in flight —and contributed to this accident.

Someone has to keep tabs on this kind of maintenance practice and bring it to a screeching halt! Quality Control isn't the only outfit responsible for insuring that quality maintenance is being performed. The only way we can expect "quality" maintenance is by bringing Operations, Safety and Maintenance all together and launching a joint effort.

Obviously, only the commander has both the responsibility and authority to bring this about. He—and his staff—must get involved in the maintenance function *at all levels.*

One good place to start is the pilot's maintenance debriefing. The bulk of the discrepancies in de-briefing fall into the following areas:

- No established/private debriefing area provided.
- De-briefing teams not adequately staffed with qualified technicians.
- Minor discrepancies not written up or otherwise documented.
- Pilot's write-ups incomplete and/or not understood by the man assigned to correct the discrepancy.

The lack of communication between the pilot and the maintenance troop may be greater than you think. Does your maintenance operation always have a supervisor available to check the write-up and to explain the work card to the man who's going to accomplish the job? Do you have a follow-up program to insure that repeat write-ups are identified and corrected?

Okay, so you've got a system established. Does it work? The best way to find out is to ask—talk to the man who is working on an aircraft and have him explain to you what the pilot's write-up means and how his action will correct it.

. . . Sound like we're changing your AFSC to Maintenance Officer? Take a look at AFM 127-1, Chapter 3, regarding maintenance and safety. And remember this: an effective safety program is the commander's responsibility, and it is kept effective under the commander's authority. The commander has GOT to get involved! ★



the two-million dollar CLIPBOARD

Finally, after sitting number one for five minutes, the RF-4C got takeoff clearance from tower. The pilot taxied onto the runway, accomplished engine run-up and completed the before takeoff checklist. All checks were normal. He pushed the throttles to 85 per cent, pulled the stick full aft, released brakes and eased the throttles into afterburner range as the heavyweight bird accelerated down the runway. In the aft cockpit, the navigator reached across to the clipboard on his left leg, extracted the pencil, noted the time and called "Off at zero-six" over the intercom.

Passing 160 knots, the nose wheel lifted off and the pilot eased the stick forward to maintain takeoff attitude of 10-12 degrees. He thought the stick felt stiff as he brought it forward, but he was well past the computed maximum abort speed of 125 knots, and everything else seemed all right. The aircraft was stabilized in pitch at this point. The Phantom became airborne, accelerated normally, and the pilot retracted the gear. As the airspeed increased, the nose began to rise, and the pilot tried to counter the increasing attitude with forward stick. He suddenly realized that the stick wouldn't go forward. He brought his other hand off the throttle to the stick in order to exert more force, and ran full forward trim, but nothing helped!

In the back seat, the navigator suddenly realized that his clipboard was no longer on his leg, but had lodged, upside down, between the stick and the vicinity of the rudder pedal adjust knob.

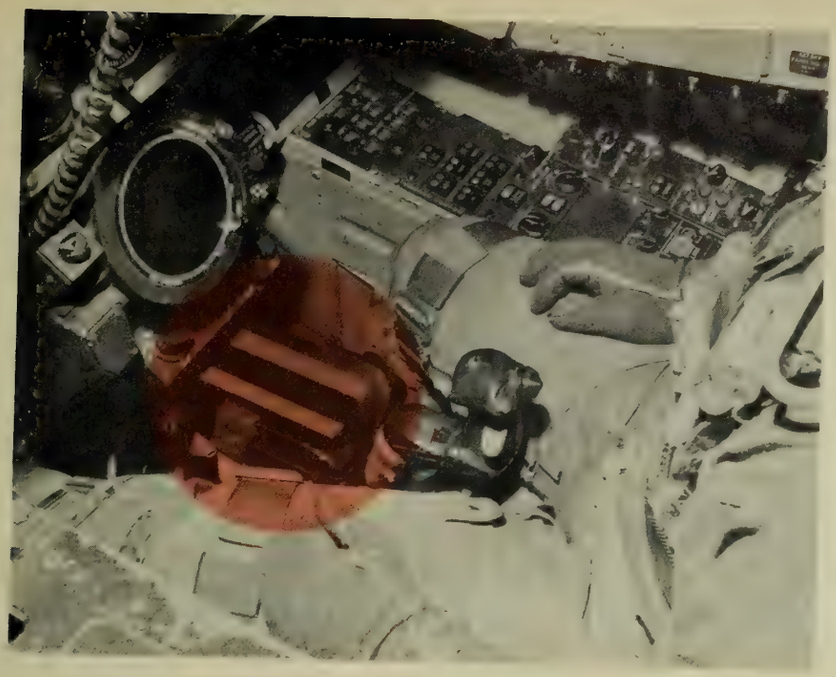
The bird continued to accelerate and the pitch attitude increased uncontrollably. The pilot continued to apply forward pressure with both hands and asked the nav tersely if he was on the controls. The nav's answer was strained and unintelligible, primarily because he was bent over in the rear cockpit, banging at the checklist with both hands, trying to force it loose!

The pilot noted the airspeed at 250 knots as the nose passed 40-50 degrees of pitch—still climbing—and he retarded the throttles to MIL power to slow the aircraft. The pitch attitude stabilized at about 40 degrees. He cycled his paddle switch several times and turned off the pitch augmentation switch, but felt no stabilator response. He considered jettisoning his external tanks, but decided against it because he was over a village.

At this time a rapid and excited conversation took place between th two crewmembers. The pilot unde stood the nav to say that his chec list was wedged forward of the a control stick (the nav later admitte that in the excitement he might ha said "checklist" instead of "cli board"), and he told the nav that would roll the airplane on a wi and release forward pressure. Ai speed at this time had diminished 190 knots, and the flashing whe light reminded the pilot that he h not yet retracted his flaps. He selected afterburner, retracted fla and rudder-rolled the aircraft to t right.

During the climb and roll to t right, the nav continued to hit t clipboard with the butt of his ha —first from the left, then from t right—with no success at dislodgi it. At about 60 degrees of bank t pilot momentarily eased some of t forward stick pressure. The n realized it for he saw the clipbo slip down slightly. Unfortunate he was in the back swing phase the time; before he could foll through, the pilot had resumed f ward pressure.

The pilot first noticed the rud pedal shaker during the roll to right. He continued the roll u the nose of the aircraft came alm



to the horizon. At about 70 degrees of bank the rudder pedal was still shaking, and he noted the angle of attack indicator at about 24 units. Then, with no control input from the pilot, the aircraft made a very lazy roll back to 20 degrees of bank. The pilot saw the airspeed decreasing through 150 knots. Seconds later the nose sliced through the horizon to the right and the aircraft entered what felt like a nose-high spiral. The pilot told the nav to prepare for ejection, made a quick MAYDAY call and pulled the lower ejection handle.

Time from brake release to punchout: slightly more than two minutes.

* * *

Well, there's the narrative. Now what inferences can we draw? The team that investigated the accident was extremely thorough; they put pilots in airplanes, trying to get an inadvertent clipboard release; they jammed clipboards and removed them until they ran out of clipboards; they ran exhaustive tests verifying the testimony of the crewmembers; they surveyed every F-4 crewmember they could conveniently get at.

—And they found that the primary cause of the accident was a design deficiency of the clipboard.

That was hard to swallow, at first. A cursory reading of the accident report led us to jump to the conclusion that cockpit confusion was the *real* cause. But after arguing ourselves into a corner several times, we find we have to go along.

There *was* confusion between the cockpits—sure! But suppose, just for a moment, that the nav had had the presence of mind to say—in a very clipped, precise voice—"My *¢&#@ clipboard is wedged in front of my stick and you'll have to bring the stick back so I can remove it." What then? Could the pilot have brought the stick back at that point? We don't know—maybe they'd have made it, maybe not.

On the other hand, a survey of more than a hundred crewmembers turned up the interesting fact that 32 per cent had experienced at least one inadvertent release of the MXU-163/P clipboard—yet there had never been an input from the field on the deficiency of this piece of equipment.

Complicating the issue is the way the clipboard fits on the leg. By design, the right strap is the long one and it fastens on the left. If the board is worn on the right leg, the clasp is to the inside of the leg where it is not likely to be released inadvertently—and even if it did, it would be flipped to the right and wouldn't go anywhere. On the left leg, though, an inadvertent release is easy, because the clasp is on the outside of the leg and lines up with various holes and protrusions in the seat and around the cockpit—and if it springs loose, it flips right into the stick area.

So the moral of the story turns out to be just what the board said it was: If you're using a piece of equipment and it is not satisfactory, *write it up!* Use the USAF Hazard Report, the EUMR, or anything else to draw some attention to it. But don't ignore a "minor" piece of equipment.

Even a clipboard can cost a couple of million bucks. ★



the perfect MURPHY

He squirmed back into the shadow of the crate in the corner, a shadow himself, and watched the crowd around the helicopter that had just been towed into the hangar. He giggled, wrung his hands and scrunched deeper into the shadows. By golly, he had really done it this time. He counted off the people around the helicopter: the chief of maintenance himself—he'd bagged a big one—the maintenance officer, the shop NCOIC and assorted other types with stripes on their sleeves.

He could hear the chief of maintenance—who couldn't?—"@)&$*$¢ you'd better find out what in the (%@¢ is the matter with this—bird."

"Yessir," said the maintenance officer.

"Yessir," echoed the NCOIC.

Several others yessired and started removing panels and other parts.

This was the second time the helicopter had been in the shop in the past few days. In fact, it had just gone out this morning for an ops check after a transmission change. The preflight had gone okay, and engine start and rotor engagement were normal. After the initial checks had been completed, the pilot brought the bird to a 3-5 foot hover for an instrument check. In a few moments a soft whine began, then ceased. After a few seconds it began again followed by a grinding sound. The crew promptly landed and shut down the engines.

When he heard about the mishap, the Lt Col who was chief of maintenance called in all the layers of supervision who were in any way concerned with the helicopter. He soon found out that the chopper's troubles started just after completion of a TCTO 10 days previously. On that occasion the helicopter was being flown in a low hover for an engine power check when a high pitched whine began, followed by a sharp decrease in main rotor rpm, flight control problems and fire flashing from the base of the rotor mast.

When they dug into the bird, Maintenance found a gear failure in the main transmission. The helicopter had been in the shop since then and had just gone out that morning for an ops check. Now it was back in the hangar and the boss wanted to know why.

The figure hiding in the shadows chuckled gleefully as he watched the green clad figures swarming over the helicopter. This was real fun. He hoped they would make the same mistake they did last time. *Fix the symptom but not the cause.* He alone knew the real cause. And he wasn't telling. Let them find out themselves—if they can.

It didn't take long for the me chanics to find the apparent prob lem. The transmission gear again But how come? The maintenanc NCOIC stood back and watched, thoughtful look on his face.

"All right, so you found it," h said. "Now let's see what reall went wrong. Give me the 781."

The following morning the NCO IC and the maintenance officer wer standing in front of the old man desk.

"Sir, it was a perfect Murphy the maintenance officer was sayin "When we pulled the TCTO, w found some plumbing that was cha ing. We decided to reroute it ar somehow-or-other the line was r installed in such a way that a che valve in the line was in backward Of course, the transmission ge couldn't get any oil, went dry an that was it."

Out in the hangar, behind t packing crate, Murphy shrugged h shoulders. So they found it, thought to himself. It's a good thi these guys aren't as thorough eve day as they are when the boss riding their tails. They'd put me o of business.

Lessee now, I'll wait a couple days to let them get back to norm Then I'll let 'em have the old hos crossed-to-the-flight-controls tric or ★

REX RILEY'S CROSS COUNTRY NOTES



FEEDBACK: Response has been good from you troops in the field recently concerning your approval or disapproval of transient facilities. Even better, we've had a lot of outstanding reports. Keep up the good work!

CLASS A PHONES: Several months ago I made the suggestion that each base ops have available a calling card-size list of telephone numbers. Looks like many of our facilities have done this, but now another problem is cropping up. The complaint came from a transient pilot who wanted to call his command post from the "Q" but was hard-pressed to find a Class A phone. Looks as though we could provide the "Q" with a Controlled Class A, with autovon, to contact home plate when the need arises. However, if no Class A is available and you have a *valid* operational necessity, the base should insure that all Class C phones have access to an operator who is able to connect you with your autovon number.

ATTITUDE: One of our conscientious TA types called to discuss attitude with me the other day. He pointed out that it's hard for the TA troops to get excited about helping transients that appear to be out on a boondoggle. To keep the record straight, all aircraft movements are so carefully supervised these days that I'm sure no one is out just boring holes. Crews that take an aircraft on a cross-country mission must have reqrirements to fill or they don't go. During my evaluations, I have to assume that the treatment I receive is representative of that particular base. The mission assigned to TA is an important one and if everyone in the business realizes this, service and attitude have to improve.

PAX CODES: Ideally, if the system works as advertised, a code properly noted on the 175 will get preferential treatment. However, the system isn't foolproof so to be sure, call ops dispatch 20 minutes or so out and let the base know. Might save a lot of embarrassment. ★

THE REX RILEY *Transient Services Award*

RAF MILDENHALL, U.K.

LORING AFB	Limestone, Me.
McCLELLAN AFB	Sacramento, Calif.
MAXWELL AFB	Montgomery, Ala.
HAMILTON AFB	Ignacio, Calif.
SCOTT AFB	Belleville, Ill.
RAMEY AFB	Puerto Rico
McCHORD AFB	Tacoma, Wash.
MYRTLE BEACH AFB	Myrtle Beach, S.C.
EGLIN AFB	Valparaiso, Fla.
FORBES AFB	Topeka, Kans.
MATHER AFB	Sacramento, Calif.
LAJES FIELD	Azores
SHEPPARD AFB	Wichita Falls, Tex.
MARCH AFB	Riverside, Calif.
GRISSOM AFB	Peru, Ind.
CANNON AFB	Clovis, N.M.
LUKE AFB	Phoenix, Ariz.
RANDOLPH AFB	San Antonio, Tex.
ROBINS AFB	Warner Robins, Ga.
TINKER AFB	Oklahoma City, Okla.
HILL AFB	Ogden, Utah
YOKOTA AB	Japan
SEYMOUR JOHNSON AFB	Goldsboro, N.C.
ENGLAND AFB	Alexandria, La.
KADENA AB	Okinawa
ELMENDORF AFB	Alaska
PETERSON FIELD	Colorado Springs, Colo.
RAMSTEIN AB	Germany
SHAW AFB	Sumter, S.C.
LITTLE ROCK AFB	Jacksonville, Ark.
TORREJON AB	Spain
TYNDALL AFB	Panama City, Fla.
OFFUTT AFB	Omaha, Nebr.
McCONNELL AFB	Wichita, Kans.
NORTON AFB	San Bernardino, Calif.
BARKSDALE AFB	Shreveport, La.
KIRTLAND AFB	Albuquerque, N.M.
BUCKLEY ANG BASE	Aurora, Colo.
RICHARDS-GEBAUR AFB	Grandview, Mo.



the other way out

MAJ CHARLES LEHMAN

Directorate of Aerospace Safety

Mention ground egress training in most squadrons and you're sure to be met with a chorus of groans—at best. If training to step out of airplanes is so unpopular, why is it almost universally required in the Air Force? Well, mainly it's because people keep getting hurt needlessly in ground escapes.

When you start reading accident narratives, the serious and fatal injuries resulting from delayed egress stand out like the proverbial sore thumb. For instance, from 1966 through 1969 33 of our primary fighter aircraft alone were involved in ground (or water) egress accidents. Twenty of these birds (61 per cent) caught fire. Of the 66 crewmembers, 47 had trouble getting out of the cockpit or away from the flames. That's almost three out of four. Seven people were seriously burned trying to get out.

The problem isn't confined to fighters, either. In nine bomber accidents during the same period, 20 of the 32 crewmembers had problems leaving their big birds. Six of them never made it! Three others were burned because of delays.

The picture is similar in training aircraft and transports.

Although a lot of things can cause delays in exiting a bashed bird, the one that really stands out in reports is the one we airplane driv have some control of—"inadequ training." It's so easy to get c placent about ground egress tr ing because we all *know* how to mount our steed. We do it ev day. But can we do it with fla

licking around our ears and blinding smoke stinging our eyes? Not always.

WHEN THE AIRCRAFT CAME TO REST THE PILOT "RELEASED" HIS PARACHUTE RISER FITTINGS AND TRIED TO STAND UP. HIS SURVIVAL KIT PULLED HIM BACK DOWN, SO HE RELEASED IT AND LEAPED OVER THE LEFT CANOPY RAIL. HOWEVER, HIS RISERS WEREN'T REALLY RELEASED, SO HE WAS HUNG UP WITH THE FLAMES LICKING AT HIS FEET. WHILE HE TUGGED AT THE RISERS THE AIR CRAFT CANOPY FELL CLOSED AND PINNED THEM TO THE CANOPY RAIL. HE WAS SLOWLY BEING SUCKED INTO THE INTAKE OF THE LEFT ENGINE WHEN THE BACKSEATER ARRIVED AND CUT HIM LOOSE.

Stories like this may be great at the bar, but too often they cost us a crewmember and make a lot of folks unhappy.

In a real emergency ground egress, there are some things which must be done quickly, correctly, and in the proper order. Yet the records and a basic knowledge of performance under stress tell us we're not apt to do everything right unless we've done it before.

Obviously we can't have people jumping out of burning airplanes just for practice, but we *can* practice the ground egress procedures in a real cockpit (with egress ballistic components safetied) or a simulator, and we *can* add some stress. Even having someone yelling, "Come on, move! Hurry up!" can add a little urgency which sometimes leads to a mistake in procedures. And that's the time to make mistakes—during a training exercise, when you can go back and do it again with only your pride ruffled.

It's not hard to come up with an effective, realistic egress training exercise. Just ask yourself a few questions about your aircraft and equipment.

For instance, can all crewmembers actuate the releases for all life support equipment to be left in the cockpit? It's not enough to *know how* to operate the releases. They've got to be able to do it—FAST. What about alternate releases, like unhooking survival kits in case the emergency release fails? Can everyone operate the canopy or hatch jettison controls?

DURING AN ABORTED TAKEOFF A BOMBER BURST INTO FLAMES. THE AIRCRAFT COMMANDER COULDN'T OPEN HIS HATCH. HE TRIED TO USE THE COPILOT'S HATCH, BUT FLAMES DROVE HIM AWAY, AND HE FINALLY USED A NOSE HATCH. HE WAS SERIOUSLY BURNED.

Maybe we can't operate emergency controls routinely, but all crewmembers should get the opportunity to actuate them at least once in a while.

How about restricted vision? Many post-crash fires cause severe vision problems because of smoke and fumes. This is especially bad in bomber and transport aircraft where the crewmembers must find the exit before they can use it.

IN A RECENT TRANSPORT ACCIDENT ONE CREWMEMBER, COMPLETELY BLINDED BY SMOKE, WAS BACKING AWAY FROM THE FIRE, AND FELL THROUGH A RUPTURE IN THE FUSELAGE. HE WAS THE ONLY ONE TO GET OUT OF THE AIRCRAFT, ALTHOUGH NONE OF THE CREW WAS SERIOUSLY INJURED ON IMPACT.

Some kind of practice in finding and opening the exits with no visual reference should be provided.

Are there alternate emergency exits which can be used when the primary escape route is blocked? People have died simply because they went over the left canopy rail from force of habit—and landed right in the flames, even though the other side of the aircraft was not burning. Practice using all exits.

The new generation of flying clothes, like Nomex suits and gloves, provides some protection in a post-crash fire. So do the helmet and, especially, the oxygen mask. But the very best protection against fire is getting away from it—FAST. To do that you've got to practice.

AS THE AIRCRAFT SLID DOWN THE RUNWAY, FLAMES FILLED THE COCKPIT. BOTH PILOTS RELEASED THEMSELVES AND CLIMBED OUT, HUNG ONTO THE SIDE OF THE AIRCRAFT UNTIL IT CAME TO REST, THEN DROPPED TO THE GROUND AND RAN TO SAFETY. THEIR TIMELY EGRESS AND FIRE-RETARDANT FLIGHT SUITS UNDOUBTEDLY SAVED THEIR LIVES.

Ask yourself a few questions about your aircraft and your flying gear, practice for the obvious possibilities, and you *can* get out of a burning aircraft successfully.

You may even be 100 yards away before the fire starts. ★

THE I.P.I.S. APPROACH

By the USAF Instrument Pilot Instructor School, (ATC) Randolph AFB, Texas

AFM 51-37

The 1 November 1971 issue of AFM 51-37 should be in every pilot's possession. It will be impossible to list every change and the rationale behind each change in this article. However, the major changes are listed below as a guide to study of the new manual.

The introductory comments on the title page contain this statement: "This manual provides adequate guidance for instrument flight under most circumstances, but it is not a substitute for sound judgment. Circumstances may require modification of prescribed procedures." This places the emphasis on sound pilot judgment when such judgment would conflict with a prescribed procedure.

Chapter One: No major changes.

Chapter Two: Title changed to "Illusions in Flight." This chapter has been updated to include the latest concepts in physiological training.

Chapter Three: The information in this chapter has been updated and expanded.

Chapters Four and Five: No major changes.

Chapter Six: The discussion of the display and use of angle-of-attack has been greatly expanded.

Chapter Seven: A complete discussion of the Control-Performance Concept of attitude instrument flying is included.

Chapter Eight: Changes include:

a. Altimeter tolerance of 75 feet applies to VFR and IFR flight.

b. Discussion of helicopter instrument takeoff added.

c. The technique for level off is applied in both intermediate and cruise situations.

Chapter Nine: No major changes.

Chapter Ten: Flight Director and Integrated Flight Instrument System information has been included in this chapter.

Chapter Eleven: The most obvious change to th chapter is the inclusion of procedural steps for cour interceptions. The procedural steps list the minimu required actions in sequence necessary for solution a course intercept problem. There should be *no* requir ment for pilots to memorize each step verbatim. working knowledge of the procedure is all that shou be required.

The chapter has been arranged so that illustratio and corresponding procedures are on facing page Numbered aircraft positions in the illustrations corre pond with numbered instrument displays and number procedural steps. Lettered aircraft positions refer corresponding instrument displays for which there no associated procedural step.

Subdued tone illustrations represent either procedur steps which may have been previously accomplished alternate courses of action.

Chapter Twelve: A slightly different technique f proceeding direct to a TACAN fix is presented. An i troduction to Area Navigation (RNAV) has been adde

Chapter Thirteen: Specific steps for tuning and a complishing ADF/RDF course interceptions have be included.

Chapter Fourteen: No major changes.

Chapter Fifteen: This is a new chapter which co solidates information that applies to all types of nc precision approaches. Changes include:

a. Criteria for descent after passing an Init Approach Fix.

b. Criteria for descent below a penetration tu completion altitude (within 5° is considered on cours

c. Requirement to establish final approach co figuration and airspeed prior to the Final Approach F

d. Revised procedures for the accomplishment a Procedure Turn. These include depiction, timing, a

descent below procedure turn altitude. Procedure turn procedures in AFM 51-37 apply only to approaches depicted with a barb symbol. All other approaches should be flown as they are depicted. (See IPIS Approach, December 1971).

Because of the numerous changes, detailed study of this chapter is recommended.

Chapter Sixteen: Minor changes to update the radar information and align the pilot procedures with FAA Handbook 7110.8B.

Chapter Seventeen: Numerous changes were made to clarify ILS information. These include:

a. Requirement to read back vector information.

b. Criteria for descent to the published glide slope intercept altitude when being vectored to the localizer.

c. Authority to descend only to localizer MDA and *not* circling MDA in the event of glide slope malfunction.

Chapter Eighteen: Information gained from the IPIS "Landing Weather Minimums Investigation" has been added in a section titled "Transitioning From Instrument to Contact Flight Conditions."

More definitive procedures for circling approaches have been included.

The USAF IPIS hopes that you will find the new AFM 51-37 a valuable tool in your instrument flying and training programs. The world of instrument flight is dynamic and constantly changing. We are in the process of collecting material for the first change to the manual, not only to correct typographical errors, but to improve procedural and background information as well. We solicit your aid in keeping this manual current and responsive to the needs of you, the pilot. Do not hesitate to use the AF Form 847 to recommend changes to this manual. ★

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MAINTENANCE MANAGEMENT COURSE

Maintenance of equipment in military organizations is a keystone to the total ability of the organization to meet its mission requirements. Normally, the maintenance element is managed by an individual designated for the task, but it is becoming more and more important that the commander and senior non-maintenance staff personnel understand what problems the maintenance manager faces. Hence, a one-week Maintenance Management Orientation Course (242) specifically designed to provide an orientation to equipment maintenance for senior military and civilian personnel who are not maintenance managers. The five class days provide coverage of maintenance policies and concepts in the Department of Defense.

The DOD-sponsored course, conducted by the Air Force Institute of Technology, School of Systems and Logistics, is for military and civilian personnel of all agencies of the Department of Defense. Criteria for attendance are established at the 0-5/0-6 level for military and the GS-13/GS-14/GS-15 level for civilian personnel although requests for waivers, based upon job and need, will be entertained. The program is outlined in detail in DOD Catalog 5010.16C, Defense Management Education and Training, available in training offices. The school is located at Wright-Patterson Air Force Base, Dayton, Ohio. ★

F-
IMPLANT

Ever had a good idea? How do you know it was good? Did you make a formal suggestion? The Air Force realizes millions of dollars from suggestions by people who have found a better way of doing things. We have to admit that few single ideas or suggestions amount to millions of dollars, but we do know of one that will amount to a tangible savings to the military of 3.6 million a year with a projected ten year saving of *28 MILLION*.

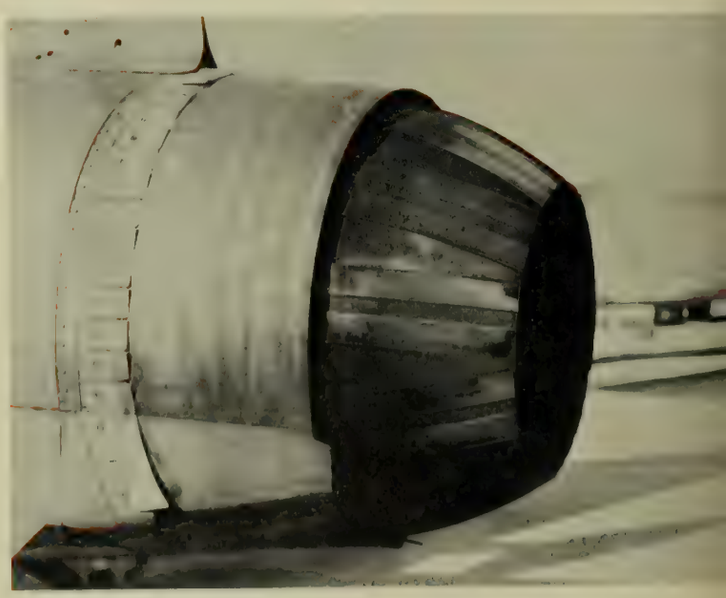
Originator of this whopper of an idea was SMSgt Mike Suzich, Jr., with the 162d Tactical Fighter Training Group, Arizona ANG. The idea is so simple it's probable that everyone else overlooked it. Here's how it all happened.

The 162d operated with F-100As for about six years (1959-1965). Throughout this period the propulsion section sweated and swore at the problems associated with afterburner operation in the Hun. Then in 1965 the unit switched aircraft to the F-102, with the same engine but a *different* AB. For the next four years or so problems with afterburners were almost nonexistent. The fellows responsible for that part of the engine began to smile and whistle again. Their smiles faded when in 1969 the unit converted back to the '100 and its -21 AB and the merry-go-round started again—compressor stalls, bent actuators on the iris lids of the AB and many other pressure related problems.

Now comes Mike Suzich who says, "Hey, if the AB on the Deuce is so good and the '100 is bad and they're basically the same engine why not swap" (or Suzich). It's hard to believe but the Deuce AB matched up beautifully with the '100 engine.

The result was a major improvement in the quality of afterburner lights, performance and reliability, plus a substantial reduction in maintenance manhours expended due to engine compressor stalls, overtemps and aft section removals.

In May 1970 action was taken to secure official approval of Sg Suzich's suggestion. AF Form 100 went on its way through channels Informal reaction that month at SMAMA F-100 Maintenance Manager's Review was positive, and MIP number was assigned.



F-100 -21 afterburner "before" transplant.

100 SURGERY

A study and evaluation of the -23 AB on the F-100 engine was completed by OCAMA in August 1970. Engineering feasibility and improved reliability were acknowledged, but recommendation was temporarily withheld. In the meantime, Lt Col C. L. Coward, 162d Maintenance Commander, and Suzich were conducting extensive installation and ground tests. All results continued to be highly favorable.

The National Guard Bureau was kept up to date on the program and testing continued at the local level. USAF was asked for a Class V feasibility study.

During February-March 1971, a full flight test program was accomplished at Tucson International Airport by engineers from both SMAMA and OCAMA. Twelve test flights and two chase flights were flown by Test Flight Maintenance Pilot, Major John M. Hartnett, in an NF-100F aircraft fitted with a standard J57 engine and an F-102 -23 afterburner. The test aircraft was fitted with 24 temperature pick-ups in the aft section and on the afterburner. The front and rear cockpits were equipped with special flight instruments, plus a camera in the rear cockpit, controlled by the flight test engineer. Drag chute deployments were also filmed in order to check for possible damage of the -23 AB by the drag chute cable.



F-100 -23 afterburner "after" transplant.

Results were continuous good lights at three-second intervals under all flight, altitude and G loading conditions for which the F-100 is operationally qualified. More than 200 lights were accomplished without a single hard light or compressor stall. With the -23 afterburner installed, a small thrust and fuel consumption increase was realized; however, this increase regained some of the performance loss the F-100 had experienced over the years. Also, temperatures in the aft section ran cooler than with the -21AB. Drag chute operations were normal with no cable hangups on the AB during crosswinds. At the end of the test, the engine was checked for trim, AB growth, heat damage, vibration and drag chute heating. All results were negative.

According to Colonel Coward, "This modification is unquestionably

IMPLANT *cont'd*



SMSgt Mike Suzich, Jr., stands beside a successfully transplanted -23 afterburner in one of his unit's F-100s.

one of the finest things to happen to the old bird." Sergeant Suzich also says that the -23 afterburner provides satisfactory service for up to 600 hours. The average time between major maintenance on the -21 AB is 150 hours. And the in-commission rate of the -23 is four times better than the -21.

A current estimate of comparative maintenance costs per 200 hour periodic cycles is as follows:

-21 Afterburner:	
Materials	$5,252.32
Labor	412.25
TOTAL	$5,664.57
-23 Afterburner:	
Materials	$700.47
Labor	116.50
TOTAL	$816.97

This difference of $4,847.60, multiplied by an average of eight current AB repair jobs per month, gives gross possible savings per year the 162d alone of $465,369.60.

On 27 September 1971 Majo Hartnett performed the final "test flight prior to USAF approval Project Pacer Transplant. The aircraft performed as advertised.

In November 1971, the Nation Guard Bureau Incentive Award Committee authorized an initi payment of $1,500.00 to Sergea Suzich for the adopted suggestio The National Guard Bureau est mates the first year's tangible sa ings to be $3,629,853.00 plus nu merous intangible benefits that w be realized after the complete F-10 fleet is equipped with the -23 afte burner.

Major General I. G. Brown, D rector, Air National Guard, Was ington, DC, personally presented th check to Sergeant Suzich at a cer mony at the 162d Tactical Fight Training Group facilities located the Tucson International Airport, 8 January 1972.

This is a Cinderella story of ho one good idea "got off the ground It was a long process, taking abo 18 months, but those involved d not give up because they knew th idea was sound and would drama ically improve the effectiveness their mission.

We know this is perhaps a ra case (notice we say, perhaps) but w have presented the facts in hop that *you* who have a good id won't forget it just because everyo doesn't line up and applaud wh you offer your suggestion. Put it writing and stick with it. If yo believe in your idea enough som one else will, too.

Congratulations to SMSgt Suzi and to all those who had the streng of their convictions and breath new life into an old bird. ★

DON'T BOTCH your connections

Capt John W. Seyfarth, 18th Tactical Fighter Wing, APO San Francisco 96239

Explosives and missile mishap reports continue to stress the importance of properly handling electrical connectors. Moisture in cannon plugs, foreign matter in connectors, bent pins, lack of protective covers, inverted connections are some of the discrepancies noted.

The result? Short circuits, fires, explosions, inadvertent firings, assorted malfunctions that have cost the Air Force lives and millions of dollars in property damage.

Since the guidance in tech data does not cover all possible hazards, the folowing general precautions for handling electrical connectors are offered.

If you observe these cautions when assembling and disassembling electrical connectors, you will be helping to reduce losses of valuable Air Force equipment, prevent possible injury to yourself and others, and increase the effectiveness of the Air Force mission.

• Insure that both ends of the connection are free of foreign matter and moisture except as prescribed by technical data. If they are not, make sure that cleaning is done as required by the tech data. Connectors are, in some instances, required to have a silicon substance applied to prevent moisture.

• Insure that all the pins are straight. If not, be sure they are straigtened in accordance with technical data before using the connector.

• Take a good look to insure that the connector has not been damaged externally.

• Before making any connection, be sure the power is off, unless specifically directed otherwise by technical data.

• Insure that both ends of the connector are properly aligned before making the connection. Most Air Force system connections have safety devices to prevent misaligned connections, but a few have none.

• Make sure the cables are properly routed.

• Once connected, be sure the mate is firmly seated, and that all locking or latching devices are engaged as directed by technical data. Also insure that all cable restraining devices are properly used.

• Insure that all cables are free from potential obstructions such as gear doors, forward firing ordnance, and moving parts.

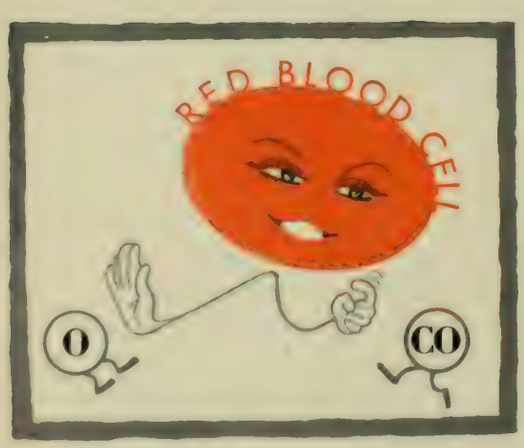
• When disconnecting connectors, make it a habit to immediately install protective covers and insure that loose cables are restrained. ★

cigarette smoking and carbon monoxide

LT COL DAVID ROOT
School of Aerospace Medicine
Brooks AFB, Texas

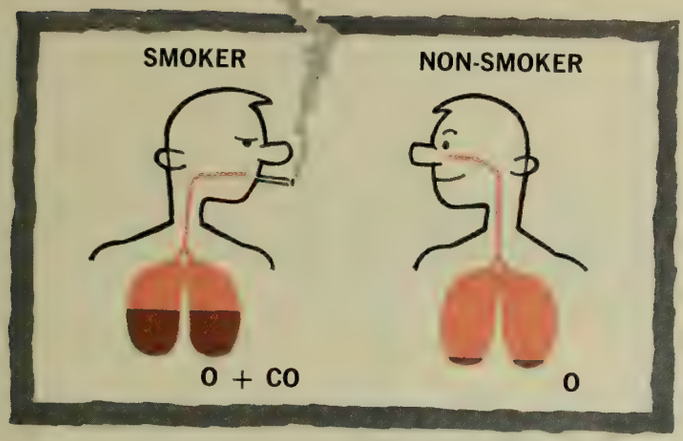
For many of us, cigarettes may be a prime source of exposure to carbon monoxide (CO), that potentially lethal, odorless, colorless gas produced by the incomplete combustion of organic material. To understand the effects of the CO produced by smoking, one must understand where in the body CO works to produce its ill effects.

Oxygen is carried inside the red blood cells in combination with hemoglobin. However, when the hemoglobin is exposed to carbon monoxide, as well as oxygen (as it is in a smoker's lung), it "prefers" to combine with the CO; that is, hemoglobin has an affinity for CO *200 times that for oxygen*. Thus, there is less hemoglobin left to carry oxygen to the tissues, creating a condition we call "hypoxia."



In a normal, pink, nonsmoking, country living body, a certain amount of CO is normally produced, equivalent to 4 to 7 parts per million (ppm) or in terms of hemoglobin saturation with CO (carboxyhemoglobin-COHb), 0.2 to 1.0 percent. Under normal conditions, the hemoglobin is about 98 percent saturated with oxy hemoglobin (O_2Hb). Next consider the non-smoking big city dweller strolling down the street where the CO level is 100 ppm, a not uncommon level in the larger cities. (Up to 1000 ppm have been recorded!) His total COHb level will rise at the rate of 3 percent per hour up to approximately 15 percent COHb after five hours of strolling. To place this figure in perspective, a level of 60 percent COHb is considered to be fatal in most cases if not properly treated. So why don't most city dwellers get sick from all this carbon monoxide? Because the wind and other factors tend to keep the CO dispersed so that the levels do not remain high for long periods. Also, levels of 20 percent COHb and higher are required to produce subjectively noticeable symptoms.

Now you may wonder—what does cigarette smoking contribute to carbon monoxide levels? Consider these facts: The average concentration of CO in cigarette smoke is about 20,000 ppm, or about 400 ppm in the inhaled mixture of smoke and air. More than one half of this inhaled CO is absorbed into the body. One cigarette, deeply inhaled will produce COHb saturation of 2 percent, and three cigarettes will produce 4 percent COHb.



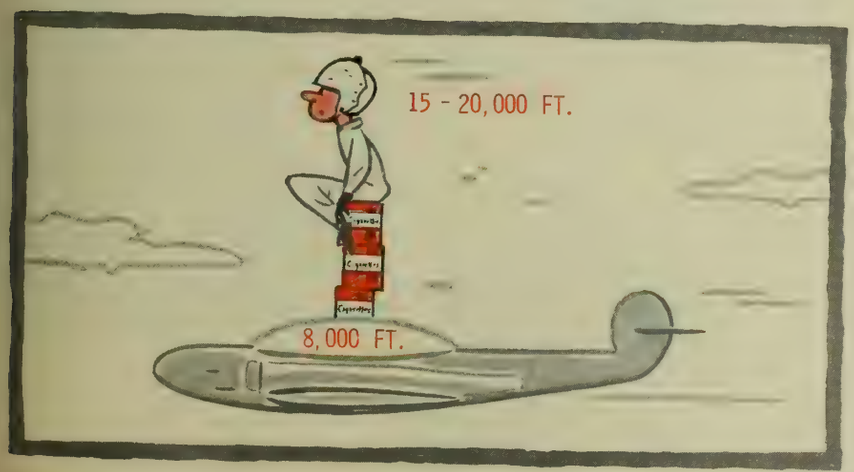
One study has shown that in terms of median carboxyhemoglobin levels, a non-smoker will have 1.2 percent COHb (due to body production and air pollution), a one-half pack per day smoker will have 3.8 percent COHb; a one-half to two pack per day smoker will have 5.9 percent COHb; and, a two pack plus smoker will have 6.8 percent to 15 percent COHb. Remember that these are average values for the whole day. It should also be stressed that all these sources of carbon monoxide are additive! "So what?" you may ask. "Aren't pilots and navigators continually exposed to a cabin altitude of around 8000 feet which corresponds to about 4-6 percent COHb?" Very true. But here again the effects of altitude hypoxia and hypoxia due to carbon monoxide exposure are additive: an aviator with a cabin altitude of 8000 feet and smoking two plus packs of cigarettes per day is at a *physiological* altitude of 15-20,000 feet.

Since the carbon monoxide levels we are discussing seldom reach lethal levels, just what effects on the body *do* they have? Probably the most hypoxia-sensitive tissue in the body is the retina. Carboxyhemoglobin levels of 3-5 percent, corresponding to altitudes of 4-8,000 feet have been shown to produce a decrease in light intensity threshold. At levels of 15 percent COHb, or 15,000 feet, the light intensity threshold was twice that at sea level, i.e., it took twice as much light to perceive an object at 15,000 feet as at sea level. In addition, the periphery of the retina is very sensitive to motion, compelling the eyes to move involuntarily when a moving or novel object, such as a bogey, is detected in the peripheral visual field, so that the object is focused on the two areas of central vision and can be seen in detail. A decrease in efficiency and accuracy of these systems could be of critical importance to the automobile driver as well as the pilot.

Tone length discrimination—the ability to tell whether a second tone is the same length, shorter, or longer than a first tone—is also known to be impaired with exposure to as little as 50 ppm CO for 90 minutes. There is also evidence indicating impairment of higher sensory centers so that limb coordination, cognitive, and psychomotor function are impaired at COHb levels of 5-10 percent.

To put it quite bluntly, the decreased O_2 carrying capacity of the blood due to the formation of COHb from cigarette smoking could mean the difference between life and death in one of those critical flight situations where your grey matter should be running at 100 percent.

A non-smoking pilot flying at a cabin altitude of 22,000 feet has approximately five minutes of useful consciousness to discover his O_2 regulator is malfunctioning; if he had three cigarettes just prior to taking off he has 45 seconds to make the same discovery. Think about it next time you fire up a coffin-nail—taste as good as it used to? ★





oh say can you see?

A difficult time for a pilot is when he takes his annual flight physical and realizes he can no longer read the 20/20 line of the eye chart. The flight surgeon and the optometrist subsequently prescribe corrective lenses for him and, if necessary, obtain a medical waiver. Crewmembers can continue to fly even if their near and/or distant









LT COL RUSSELL B. RAYMAN, USAF, MC, Directorate of Aerospace Safety



visual acuity deteriorates from 20/20 to 20/200 *IF* corrective lenses can restore normal visual acuity and *IF* they are worn during flight.

Glasses require some adjustment that certain individuals do not readily accept. Consequently, some pilots, especially those with small refractive errors, do not wear the glasses prescribed for them. They continue to fly with abnormal vision, not fully realizing that a threat to flying safety exists even with a small refractive error.

But first, a brief description of abnormal visual acuity. Most individuals with abnormal visual acuity will be either myopic (nearsighted) or hyperopic (farsighted). Myopic patients can see near objects clearly but have difficulty seeing distant objects. Thus, glasses are prescribed to correct distant vision. Hyperopic patients, on the other hand, cannot see near objects clearly but can see distant objects (there are some exceptions to this as some hyperopic individuals have difficulty focusing clearly on distant as well as near objects). Therefore, in the case of the hyperope, glasses are prescribed to correct for abnormal near vision.



In addition to hyperopia and myopia, there is another condition, which is really a type of hyperopia, called presbyopia. Presbyopia is a process which happens to almost everybody with aging. As one gets older, the lens of the eye becomes less able to focus upon near objects. Therefore, reading and writing slowly become more difficult. This person needs what we call reading glasses so he can focus clearly on near objects.

The conditions described, besides causing abnormal near or distant vision, if uncorrected, can further compromise one's ability to see by reducing depth perception. This may occur because the amount of myopia, hyperopia, or presbyopia may not be exactly equal in each eye.

Now let us enter the cockpit. Pilots must have good vision: good near vision for the instruments, controls, and map reading, good far vision for seeing other aircraft, for takeoffs and landings, and for formation flying. Depth perception is especially critical for landing and formation flying. It is for these reasons that glasses are prescribed and required to be worn at all times in flight.

Perhaps you are wondering whether there have been any aircraft accidents in which a pilot with abnormal vision, and not wearing his glasses, was a contributing factor to the accident? The answer to this question is YES. There have been nine such cases of hyperopia, six cases of myopia, and one of presbyopia. Rather than discuss each of these 16 examples, only a few need be illustrated to make our main point:

- An F-4 pilot with hyperopia (abnormal near vision) was flying without glasses. He had a flameout at low level, due to incorrect positioning of fuel toggle switches, resulting in loss of the aircraft. It was determined that this error was made due to blurred near vision.

- A T-33 pilot with hyperopia was flying without glasses and landed short of the runway. Poor depth perception was considered a definite factor.

- An F-4 pilot misjudged his altitude while flying at low level over water and subsequently crashed. He was myopic (blurred distant vision) but not wearing glasses. Poor depth perception and blurred, distant vision were considered factors in this accident.

- An F-102 pilot with hyperopia landed short on a GCA landing. He was not wearing his glasses and could not read the instruments clearly. Misreading the altimeter contributed to this accident.

These are only four of the 16 known cases in which the pilot was flying on a medical waiver for abnormal visual acuity, was not wearing his glasses and, in each case, was a factor in the accident.

Our message is simple. In order to ensure normal vision and safety in flight, pilots and navigators with abnormal vision must wear their prescribed glasses at all times during flight. ★

Ops topics

BENT SABRE

The mission was local IFR training in the T-39, and the flight was terminating with a minimum-roll landing. Shortly after touchdown, the upgrading pilot shut down the left engine (a normal procedure, which shortens the T-39 landing roll to a remarkable extent) and applied what appeared to the IP as normal braking pressure. The runway was patchy with snow, however, and the left main wheel brake was apparently locked. When the left main tire passed over a dry spot in the runway, BAM!—it blew! With the left tire blown, the left engine shut down, a ten-knot crosswind from the right and an RCR of ten, directional control was impossible and the bird impacted a snowbank 35 feet off the left side of the runway.

All these bad conditions—the crosswind, the RCR, the patchy runway, etc., were cited as contributing causes to the accident, and we have to agree—with the added comment that the conditions add up to a heck of a time to practice and leave us room to doubt the judgment of the IP.

The primary cause of the accident was supervisory factor, in that the IP allowed the upgrading pilot to practice minimum-roll braking technique during a training mission. This might be a good time to dust off AFM 51-33, the T-33/T-39 Aircrew Training Manual, and take a look at paragraph 2-6c(3). The manual authorizes minimum-roll landing to be practiced *through approach and touchdown only.*

WHAT YOU SEE IS WHA

Prevailing visibility below the 1100 foot ceiling was good, and the pilot established visual contact with the runway at about three miles. He lowered full flaps at that point and continued his approach, which appeared normal in all respects. Airspeed was correct and stable. At about two miles, the pilot noted that the approach end overrun was clear of snow, and that the aim point he had been using was the end of the overrun, rather than the end of the runway. He raised the nose slightly to adjust his aim point, and maintained proper final approach speed until crossing the end of the overrun. Power was reduced at that point, and the pilot began his flare.

In the rear seat, the copilot noted the aircraft was slowing and called "airspeed!" over the interphone to alert the pilot. Airspeed continued to dissipate. A partial stall occurred and the aircraft landed hard, in a left-wing-low attitude, 200 feet short of the runway. Landing forces resulted in structural damage to the left main landing gear, and rolled the aircraft back to the right with sufficient force to scrape the right tip tank on the overrun surface.

HEADS

A cross-country F-102 was cruising westbound, int the sun, at an assigned flight level of 350, when Cente gave him instructions to descend immediately to Fl 310. Seconds later, a commercial DC-8 passed over head, on line, eastbound, 200 to 300 feet above th Deuce! The airliner was also assigned FL 350. Th Deuce pilot stated that, had he not started an imme

YOU GET (SOMETIMES)

The pilot was fully qualified in the aircraft, but he was pretty low on total time (less than 500 hours), and there have been many older, wiser heads drawn into a trap by the conditions he found during his approach. Consider:

- The runway at destination was 2300 feet longer and 250 narrower than the one he was used to.
- There was no VASI, no ILS glide slope and no PAR available for his approach.
- The terrain surrounding the runway was rolling hills, snow-covered, and afforded minimum depth perception aid.
- Light snow and rain on the windscreen impeded direct forward vision (as did the pilot's visor, which had been lowered at altitude and not raised for approach).
- The 19-knot headwind on landing was appreciably greater than any the pilot had previously encountered.
- The full-flap, high-power, flat approach is very conducive to rapid airspeed bleed-off when power is reduced and pitch attitude increased.

UP!

diate descent when instructed, a collision would have occurred.

Don't know yet who was wrong, but *somebody* was! And after a midair, it doesn't usually matter, to those most closely involved, where the fault was. Keep those eyeballs moving, folks!

FLIP CHANGES

Hijacking Attempt:

Procedures were implemented effective 1 January 1972 whereby U.S. Air Traffic Controllers upon observing the established Hijack Code on radar are required to ask the pilot if the squawk is intentional. See ATC RADAR BEACON SYSTEM in the PROCEDURES Section of the IFR Supplement for details.

OLD FASHIONED PROPWASH

The Gooney Bird was number one for takeoff on runway 32, holding short, when the control column and yoke suddenly began violent oscillations. The IP attempted to neutralize the controls, but was unable to hold them. He declared an emergency on tower frequency, stating that the aircraft was out of control. Simultaneously, the RSU officer observed the tail section of the C-47 bouncing up and down and advised tower on a landline that a C-130 was running up with its tail toward the C-47.

As the oscillations ceased, the IP of the C-47 said that he thought he had sustained control surface damage and was shutting down to inspect the aircraft.

Meanwhile, the C-130 pilot had finished his runup and turned his aircraft toward the runway. He advised the tower of the damage to the C-47, and tower advised him to return to the parking ramp.

This was a clear-cut case of pilot goof. The C-130 pilot was aware of the Gooney Bird in number one position, but stated that he believed his position for a 30-second runup would not direct prop blast on the aircraft behind him.

HOWEVER:

Wind at the time of the incident was 360 degrees at 16, gusting 22. The C-130 is required, when the wind exceeds 10 knots, to run up within 30 degrees of the wind. The taxiway leading to runway 32 is oriented north-south. Put them all together, they spell C-R-U-M-P!

The base in question has a 7000-foot runway oriented 18-36, and it seems to us, the winds being what they were, that runway 36 should have been in use.

Ops topics

CONTINUED

KNOW YOUR SYSTEMS?

The C-130 was on a night training mission. At the end of the mission, the aircraft was brought to a stop in the parking area, the parking brake was set, engines one, two and four were shut down, and a bleed air check was initiated with Nr 3 running.

Suddenly the IP noticed that they were rolling! He quickly selected Emergency Brakes and applied brakes while the student reversed Nr 3 engine. The aircraft rolled approximately 30 feet before it was stopped, and a Nr 2 engine prop blade struck a power cart, but there was no damage.

So this is an accident that didn't *quite* happen, and there are several lessons to be learned. Mitigating circumstances include darkness, a broken right forward brake hose fitting and no checklist available for this operation.

- The crew must constantly monitor outside if an engine is running, to detect inadvertent motion. Darkness merely dictates extra diligence.
- Murphy is *always* present. If something *can* go wrong, it *will!* In this case, the broken fuel hydraulic fitting cost the crew the residual pressure to the parking brakes.
- Using number three to check bleed air was an unwritten standard procedure in this unit—most pilots did it the same way. Someone should have considered the need for back-up safety precautions, however, since utility hydraulic pressure (for brakes) in this model comes from engines Nr 2 and 4. Selection of Nr 3 should have dictated selection of emergency brakes and aux pump ON prior to starting the check.
- And, since these checks always took place in the parking area, we can see no reason for not having chocks in place, as required for all maintenance ground runs.

How about your procedures? Have they been Murphy-proofed?

NIGHT WORK

Two recent incidents, although on different aircraft, have a relationship. The first occurred during a search for a missing fuel selector knob in the cockpit of a fighter. The knob was not found so it was decided to remove the seat and check further. A final check was made to insure all the pins were in before removing the seat. However, during removal the initiator, rotary actuator, lap belt, and associated ballistic plumbing were actuated and performed as advertised.

In the second, the seat was being transported in a truck. During removal from the truck the M-32 initiator was fired which again caused all the components to function. The interesting part about both of the incidents was that they happened at night. In the first case only a flashlight was used to remove the seat in an unlighted area. In a recent issue of *Aerospace Safety* we stressed the importance of close supervision on the line after dark.

Supervisors, are you sure that there is someone there to mind the store after you leave?

TIE ME RADIO DOWN, SPORT

Ever lose a radio? Here's a pilot who lost a couple of them.

The O-2A was returning to home station. After clearing the mountain range to the east, he was descending briskly when the aircraft encountered severe clear air turbulence. The plane rolled violently to the left, and the pilot reduced power and recovered as quickly as possible. The G meter read 1.2 negative. The pilot made a controllability check, determined his plane to be controllable, and continued to a normal landing.

After landing, the crew discovered that two radios carried as cargo were missing, the top rear window was broken out and the rear prop had been damaged by debris.

It's easy to get sloppy—if you've got something to carry, just toss it in the back and let's go. But we've lost a lot of airplanes over the years from just that. Unsecured cargo has slid forward on landing, causing major injury; slid aft on takeoff, causing an extreme aft CG and the resulting crash; looped, bound, and tangled and jammed flight controls on hundreds—perhaps thousands—of occasions; and has been the cause of more grief than anything so easy to correct has a right to be.

The solution is simplicity itself. Anything in an airplane that could cause damage if it moved around should be secure. Don't just toss it in the back and press on. Tie it down! ★

INSIDE JOB

LT COL RICHARD H. WOOD
Director of Aerospace Safety

Everybody knows about SOAP by now—we hope. Not the kind you wash your hands with—the kind that tells you when your engine is about washed up. We've come a long way with the Spectrometric Oil Analysis Program, but there is still a long way to go. As a routine operation, accident boards and safety officers recognize the need to examine SOAP records as a part of the investigation of an accident. Unfortunately, there are some grey areas that confront anyone attempting to derive meaningful data from these records. There are, however, some statistical methods available which can help in determining whether the engine is or will be the main participant in an accident.

The truth is that oil analysis is a comparatively new technique and, although we have guidelines, hard and fast rules on limits and trends are not completely developed. The success of the program depends largely on the ability of the SOAP technician to spot an abnormality, which might be a single high reading or a rate of increase which looks bad to him. He gets some of his ability through training, but a good deal of it comes from experience. He's looked at a lot of oil samples and he's developed (we hope) a mental picture of what's normal and what's abnormal for a particular engine.

Since we have trouble quantifying these abnormalities for the lab technician, it's not surprising that we have a little trouble looking at the analysis figures and second-guessing his decisions.

One problem is that the numbers on the SOAP records (see Figure 1) are not particularly meaningful by themselves. Take a single iron (FE) reading of 12 ppm (part per million). To make something out of that, you'd have to have some idea of what was normal for that engine and what was the guideline limit for that element, that engine, and that analyzer.

Suppose the FE readings went from 8 to 12 to 16 ppm over three successive samples. Is that significant?

Maybe. Maybe not. We expect some wear and we expect the results of this wear to accumulate in the oil and progressively increase the readings. What we really need to know is how much it increased per unit of time. Since we have the iron content readings and the engine operating hours for each sample, we can subtract and divide to come up with the *rate* of increase per operating hour. This we can compare with the *rate* calculated for an engine we know (from experience) is wearing normally.

We must be careful that our calculated rate did not occur over an oil change, since new oil would invalidate the trend. This is no problem as the SOAP records also show time since oil change.

Now we're in a position to evaluate our 8-12-16 trend and this is essentially what the experienced lab technician does. He mentally judges and compares rates; it may be a long time before we figure out how to replace his experience and judgment with a computer.

All this is leading up to a method an investigator can use to reduce SOAP data to some form that is easier to investigate and describe in a report.

Since we're interested in change per unit of time, we can get the

HOURS SINCE O/H	HOURS SINCE O/C	SPECIAL INFORMATION	Fe
5[illegible]	[illegible]	[illegible]	14
[illegible]	[illegible]		15
[illegible]	[illegible]		12
534	7		6
[illegible]	[illegible]		10
[illegible]	[illegible]		11
561	[illegible]		11
[illegible]	[illegible]		12
585	2		4
594	12		7
608	25		10
619	[illegible]		14
629	[illegible]		6
639	[illegible]		8
659	33		11
667	41		12
667	51		12
687	7		5
696	16		10
714	32		13
725	44		(16)
725	46	SPECIAL	4
729	50		(18)
732	3	SPECIAL	7
[illegible]	[illegible]	SPECIAL	12
[illegible]	[illegible]	SPECIAL	(16)
[illegible]	.25	SPECIAL-REAR ENGINE MOUNTED REAR BOX	6
[illegible]	.5	SPECIAL	7
[illegible]	1	SPECIAL	12

FIGURE 1. The data above was extracted from the AFTO Form 119A for a J57 engine. For the purpose of this article only the iron content readings are shown.

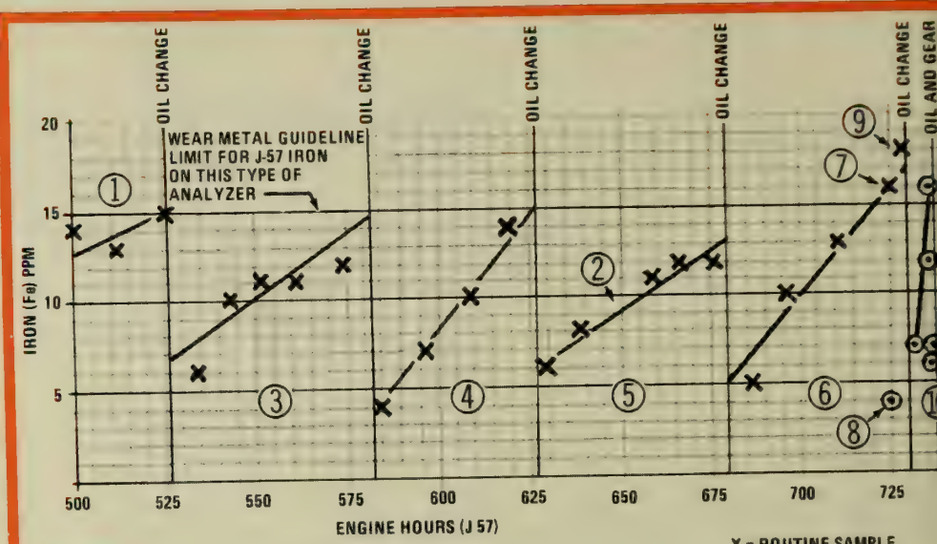


FIGURE 2 PLOT OF SOAP HISTORY

same results with graph paper that we can with a slide rule. The slope of the resulting curve will be the rate of change.

The SOAP Tech Orders suggest this method, but don't provide much information on exactly how to do it. We've selected one method that might be of some use in an investigation (Figure 2).

To do this, we've analyzed about 250 hours of the SOAP history of a J57 engine. This particular engine was transferred to a new unit and its oil analysis responsibility assumed by a new laboratory. For some reason, the old SOAP records did not go with the engine, so the new lab started from scratch, so to speak.

Eventually, the engine quit due to failure of the engine accessory drive (bull) gear and cost us an airplane. Naturally, we developed a big interest in whether this failure could have been predicted by SOAP.

Figure 1 shows some of the SOAP data available to the accident board. For clarity, we've included only the FE readings. This same data has been plotted on the graph in Figure 2.

To construct Figure 2, we plotted engine hours against FE readings in parts per million. The guideline limit for FE in this engine tested on this analyzer is 15 ppm. We've also plotted oil changes as vertical lines at the appropriate engine times. We've elected to treat each oil change as a separate graph and to examine the trend developing in that oil.

Instead of drawing a line connecting each sample reading, we've sketched a "best fit" curve that averages the readings between each oil change. This technique is statistically acceptable and provides a more accurate trend (slope) by averaging out minor variances in spectrometer calibration.

Now we're ready to analyze. The paragraphs numbered below correspond to the circled numbers on Figure 2.

1. This was the SOAP lab's first look at this engine. Although this isn't much of a trend, the readings are roughly twice those normally found in a J57. The reading just before oil change was right on the guideline limit, so the red warning flag was already up. From this and the other readings, it is obvious that this lab was not going to take any action unless the reading actually exceeded the guideline limit. Apparently, they were using the guideline as firm go-no-go criteria in ignorance, perhaps, of the introductory instructions in both SOAP tech orders. They could have requested special samples or queried the former lab for more history, but they did neither.

2. The unit owning the aircraft is required to take routine samples every ten hours, or as close thereto as possible. This is the only "hole" in the sampling intervals, where a sample was either not taken, or taken but lost in transit to the lab. It is apparent that the unit was doing its part and supporting the oil analysis program.

3, 4, 5, 6. Each of these shows a trend considerably steeper than anything seen on a J57 that is wearing normally. SOAP trends are seldom this dramatic. In "4", the trend was obviously going to go beyond limits and the engine was "saved" only by a timely dose of new oil. Here, in fact, was an engine that was "hooked" on oil. By eliminating the symptoms, it hid the problem. It's not nice to fool the SOAP lab by sneaking in new oil, which is why the time-since-oil-change is reported with the sample. Unfortunately, the significance of these trends was not caught by the SOAP lab.

7. Finally, we got a reading that was out of the ballpark. Finally, the SOAP lab told the unit they might have a problem and requested a special sample.

8. This was the special sample and something went wrong somewhere. None of the wearmetal readings on this sample correlated with any of the history of this engine. It looked like two samples had been switched, somehow, either in the sampling, transportation, analysis, or posting. A prudent lab technician might have suspected that something was amiss and thrown this sample out and requested another.

9. This was the next "routine" sample. No mistake here, they've sampled the right engine again. The engine was put back on special sampling procedure. Grounding was not recommended.

10. The remaining samples were all special samples. After the special sample of 16 ppm, grounding was recommended. The unit changed the engine mounted gearbox (as suggested by TO 42B2-1-10), changed the oil, and took samples after 15 and 30 minute ground runs. These tested at 6 and 7 ppm and were reported by the lab as normal for a J57. Perhaps, but not for a J57 that just had clean, fresh oil installed. A reading of 6-7 ppm is high for clean oil and a rise of 1 ppm in 15 minutes is a pretty sporty trend. The problem was not the engine mounted gearbox and the ground run samples indicated that something was still wrong. The unit was a little suspicious, so they flew the plane 1.7 hours and submitted another special sample, although none was requested by the lab. The unit attempted to obtain the results of this sample before flying the plane again, but the sample had not yet been received by the lab. The maintenance officer made a "judgment call" and elected to fly the plane. On the basis of what he knew about the engine at that point and what the SOAP lab had told him, he had no basis for grounding it. We wish he had, though, because the accessory drive gear failed on this flight and the plane crashed before the final sample was analyzed by the SOAP lab. Perhaps he would have decided differently if he had had a graphic picture of what his engine was trying to tell him. Unfortunately, SOAP records are maintained at the area SOAP lab and in most cases, the maintenance officer must rely on their analysis.

Now that we've graphed the problem and seen the deficiencies, the findings and recommendations tend to jump off the graph paper and into the accident report all by themselves. With the graph attached, they are fairly easy to explain and substantiate.

Incidentally, the accident board arrived at all the proper findings and recommendations without (as far as we know) resorting to graph paper. Their SOAP investigation was much more extensive than is described here and they did an ex-



Experts say any engine oil-wetted part will tell us when it's about to fail, if properly analyzed. This one did!

cellent job. Obviously, a thorough analysis can be made with just the raw data. We're presenting this as merely one method of putting a large amount of data into a form that is easy to understand and easy to explain to others.

As you would expect, the units most concerned about oil sampling are those equipped with single and twin-engine airplanes. We understand that one wing has established a procedure that *after each flight* the pilot has the oil sample with him when he arrives at debriefing—even though a sample is due only after each 10 hours of flying time. Another outfit includes a copy of the SOAP historical data sheet with each airplane that goes cross-country, thus insuring that the SOAP lab at the transient base can spot a trend.

Another unit stamps "oil sample due" in the discrepancy block of the 781 to insure samples are taken after each mission.

In spite of the combined efforts of those directly involved with accurate assessment of oil samples there are always ways of negating the system. A practice by one unit, changing oil every few hours as a routine, instead of the recommended 200-600 hours, can reduce the effectiveness of analysis. To be useful everybody has to abide by the rules!

If the SOAP program is going to be completely successful, it's going to take a bit of effort by everyone involved. Most of all

- The lab must be adequately staffed by trained personnel.
- It must be responsible to units within 24 hours.

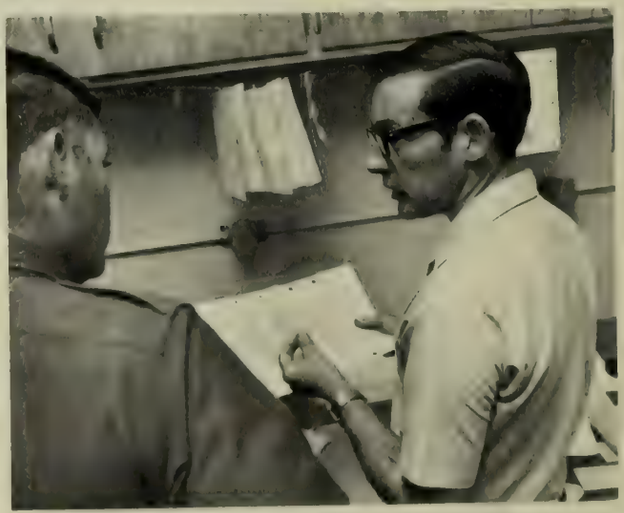
In the final analysis we think that the success of any program such as this is in direct relationship to the emphasis placed upon it by the commanders and supervisors. ★



479 FMS SOAP laboratory supervisor, William C. Moffat, calibrates Perkins-Elmer 303 unit in preparation for the day's analysis.



J79 engine oil samples are tested for iron content by SSgt Raymond B. Borm.



Moffat discusses trend shown by oil samples with **Aerospace Safety** editor, Lt Col C. W. Minett.

Toots

is interested in your problems. She spends her time researching questions about Tech Orders and directives. Write her c/o Editor, Aerospace Safety Magazine, AFISC, Norton AFB, CA. 92409.



Dear TOOTS

Recently one of our aircraft encountered a birdstrike. The pilot estimated approximately 30 birds in the flock. Visual inspection revealed that birds had struck both drop tanks, both wing slats, right stabilator and at least one bird had been ingested into the engine. No aircraft structural damage was noted. Forward portion of the compressor section showed feathers, blood and guts; however, there was no visible damage to either compressor or rotor blades as far back as could be seen with a strong light. Compressor bleed port was removed and found to be clean. Turbine and afterburner section showed no evidence of damage.

AFM 66-3, chapter 2, paragraph 2-1, item d(2) classifies this as foreign objects organic matter. Paragraph 2-2, item d(3) states, "Organic matter does not commonly cause foreign object damage to gas turbine engines; however, large birds are an exception and a concentration of birds is a definite hazard."

Our problem, TOOTS, is this: We have no way of knowing what constitutes a large bird, or how many small birds are required to make one large bird, or for that matter, how many birds were actually ingested into the engine. TO 1F-100C(1)-6, TO 1-1-200, TO 2J-J57-26, and the 00-25 series TOs were consulted, and we could find no guidelines as to what type of inspection was required. How far should we go to determine if we have a problem or should we clean up the mess, run the engine and let the aircraft fly?

It is felt that the -6 TO for all aircraft subject to this type of problem should have definite inspection requirements spelled out.

SMSgt William H. Jensen
102 Camron, Mass ANG
Otis AFB, MA 02542

Dear Bill

I can't tell you how many small birds it takes to make a large bird, or even what constitutes a large bird. But I can give you a reference to follow when inspecting for FOD—TO 2J-J57-26, para 5-69, "Compressor Blade—Inspection and Repair Limits." This paragraph lists the inspection and repair criteria, regardless of the damage source.

I would suggest that, following a birdstrike, you inspect the aircraft in accordance with 2J-J57-26 to determine the extent of damage. If there is damage, repair as required. If no damage was incurred, or after repairs have been made, then clean the engine thoroughly; this should prevent future air-conditioning write-ups. Finally ops check the engine. If no problems have turned up by this time, the aircraft should be released for flight.

Toots

Dear TOOTS

Possible situation during a training flight in a multi-engine aircraft, recip type: We have a checklist of items to perform during engine failure shutdown. One of the items is "FUEL, OIL and HYD SHUT-OFF switch to off." One switch completes this action.

My question is this: "Do we simulate this switch off, or do we actuate this switch off? Why ask for a problem if either valve were to remain closed during engine restarting?" Please answer with reference to TO or other means.

MSgt John Jesse
143 Special Ops Sq
T.F. Green Airport
Warwick, Rhode Island

Dear John

Yours is a real good question. Your reference is AFM 60-16, para 5-11, which makes the major command (TAC, in your case) responsible for setting these policies.

I would also suggest that you visit your squadron stan eval section. They can bring you up-to-date on all established procedures, both major command and locally directed.

Toots

Tech TOPICS

MURPHY LIVES!

The crew of a four-engined transport encountered severe flight control difficulties just after takeoff on a routine airlift mission. The aircraft's right wing was extremely heavy; it took twelve degrees of trim and two-thirds of the available opposite aileron to keep the aircraft under control. The pilot immediately declared an emergency and, despite his problems, managed a successful landing.

After they were back on the ground, the reason for the flight control difficulties became painfully apparent. The right aileron was **disconnected!** It seems the aileron push-pull rod had been disconnected during some fuel tank maintenance and this Red X condition was never entered in the forms! The rod was forgotten and never reconnected when the maintenance was completed. The inoperative aileron was overlooked by the flight engineer during preflight, because he completed his checks without a ground scanner!

—MAC Flyer

TECH DATA???

When the nose gear of an F-104D failed to extend and the aircraft had to be landed on the mains, investigators found a broken bungee spring, excessive lubrication of the drag strut, and a locking block installed backwards. The broken bungee spring could not exert enough force to overcome the excessive lubrication of the drag strut and improperly installed locking block.

Proper lubrication for all moving parts is a must; however, excessive lubrication coupled with a build-up of dirt results in sluggish operation, binding and failure.

Sound supervision, proper use of tech data and a sharp inspector would have prevented this incident.

COMMANDERS: *Failure to use tech data is one of the most frequent deficiencies documented during UEIs.*

MO

BITS & PIECES

Excessive amounts of metal shavings and other bits and pieces were found in the under-floor compartment which houses armament relays and connectors in the OV-10.

One of these metal shavings had shorted a relay causing Nr 1 pod to jettison in flight. The pilot was unaware that the pod was missing until the dearming crew discovered it.

Try reading the cause of this incident again and think about how better supervision could have prevented it. Sometime in the past a supervisor failed to note the debris in this compartment. Policing the area does not only mean the ramp. Any time maintenance is performed the affected area should be thoroughly inspected for foreign objects before the aircraft is released for flight.

COMMANDERS: *Cockpit FOD is cause for a red cross entry in the 781. Do all your people know why?*

MO

"SHORT CUT" MAINTENANCE

During maintenance on a WC-135, an oil leak was discovered. Corrective action was to re-torque the B-nut. Later, during flight, Nr 4 oil pressure began fluctuating, finally exceeded limits, and the engine had to be shut down.

It wasn't difficult to find the problem—a leak at the same place as before. This time the O ring seal was properly inspected and found to be extensively damaged. Replacement of the seal and torquing of the B-nut per the TO solved the problem. But this example of "short cut" maintenance cost an engine change.

WHERE ARE THE 781'S?

This incident occurred at a transient base during an out-and-back mission in a T-38.

After a short visit to base ops, the IP and his student arrived back at the aircraft to find that refueling had just been completed. However, the 781 form had no fuel entries, so the IP asked the crew chief to make the required entries. The IP then climbed into the aircraft and proceeded with the interior checklist. The IP noticed the crew chief hand something to the student. Thinking it was the 781, he started the engines.

After takeoff and gear retraction, the red light in the gear handle stayed on. The gear was cycled and the light went out so the mission was continued. Upon arrival at the home base it was discovered that the nose gear door was slightly damaged and the 781 form was missing. You're right—the crew chief had stowed the 781 in the nose gear door which jammed and was damaged during retraction. The forms were most likely lost during the recycling.

SUCTION PUMP

While the engines of a T-38 were being operated at 70 percent for an ops check to complete an inspection, the ground observer approached the aircraft to check a malfunctioning ram-dump port. As he approached the intake he felt the suction and immediately dropped down to exit the danger area. In doing so his head bumped the lower portion of the intake and his headset was jarred loose and ingested down the intake. Both engines were immediately shut down, but the left engine was severely damaged.

Think for just a moment how close this man came to disaster. Granted the T-38 intake isn't very big, but just suppose that his head had been drawn into the intake. He could have been asphyxiated.

1T-38A-2-1, para 1-21 clearly explains the danger areas during engine operation. Supervisors, how long has it been since you briefed your troops on the hazards of operating aircraft engines?

INSPECTION FIRST—SIGN OFF SECOND

Forty minutes after the RC-135 took off Nr 3 throttle was noted to bind, followed shortly by an increase in RPM to 106 percent. By then the throttle had no control over the engine speed so the engine was shut down.

The cause—maintenance. The throttle control rod was disconnected from the fuel control. The nut and bolt from the linkage was found in the lower cowling; however, a searching inspection failed to turn up the cotter key.

Review of the aircraft records showed that this engine had been rerigged twice in the past 10 days. The cotter key had apparently not been installed during the last rerigging.

This incident underlines the reason for thorough inspection of maintenance that has been accomplished. The 00-20 series tech orders are very clear: "The inspection of maintenance accomplished will be completed prior to the inspector signing the 781-A."

COMMANDERS: *Do you review maintenance Quality Control Inspection reports? Do your inspectors identify non-use of tech data? Are your responsive actions aimed at correcting the cause?*

OLD PART SNEAKS IN

Just after takeoff, as the gear was retracted, a loud snap was heard from the nose wheel area of the F-101B. Gear warning light and horn remained on and the wingman reported that part of the nose drag link was hanging loose. The aircraft was returned to base and stopped on the runway where the down locks and a jack were installed under the nose before the engines were shut down.

Studies of the broken drag brace link assembly revealed that it was an obsolete part. The aircraft records indicated that this part had been replaced during TO compliance several years ago.

It could not be determined how or when the obsolete part was reinstalled on the aircraft, but somebody goofed.

COMMANDERS: *How many untagged aircraft parts did you find on your last trip through the shops?*

Tech TOPICS

BRAKE FIRE

KC-135—While taxiing after landing the crew heard a noise like brake chattering and saw sparks coming from under the right wing. They stopped and evacuated the aircraft. Firemen extinguished a grease fire in the Nr 7 wheel axle area.

The fire resulted from wheel wobble and subsequent damage caused by a wheel position collar being omitted during assembly of the wheel after a brake change.

This may seem like a minor mishap and some people probably think it's not worth the space it takes to tell about it. If this happens to be your opinion, consider the fact that this incident cost more than $8500. We can't afford very many of these.

COMMANDER: *Nor can you afford shoddy maintenance.*

B-NUT BLUES

The KC-135 was 30 minutes out on a refueling mission when Nr 2 engine oil pressure started fluctuating 15 to 45 psi accompanied by a flickering oil pressure warning light. The engine was shut down and a three-engine return to base accomplished without further incident.

The problem was that the oil line B nut from Nr 6 bearing oil scavenge pump had backed off at the engine fire seal connection allowing depletion of the oil supply. Maintenance had recently been performed in this area during engine build-up and the B nut had not been safety wired iaw current directives.

This unit has expanded its critical area inspection checklist to include complete supervisory inspection of this area. How about it, supervisors? Is your current critical area inspection checklist sufficient to cover all critical areas of maintenance?

TOOL ACCOUNTABILITY

During investigation of a T-33 accident a six-inch screwdriver was found in the wreckage. The screwdriver had become wedged in the nose gear uplock assembly, causing failure of the emergency extension system. At the same time, the normal hydraulic system failed due to materiel failure of a right main gear up hose.

The T-33 doesn't land very well on one gear, so the end result was a major accident.

Unfortunately, ownership of the screwdriver could not be determined. The Air Force paid a mighty expensive price for a lesson in tool accountability.

USE YOUR HEAD

After all these years, we still have those stupid accidents that are caused by simple human oversight or negligence. Chock jumping is one type that comes to mind because we've had several recently, including one in which a man was killed.

There may be some circumstances that can't be foreseen which could cause an airplane to jump its chocks. But we can't think of one. Invariably, chock jumping results from someone's failure to use his head. The most common cause is failure to set the parking brakes, which is really a case of not following the checklist. A funeral is a helluva price to pay for the few moments it would have taken to read and follow the tech data.

THE HIGH PRICE OF FAILURE

After the C-130E touched down during a night max effort landing, the tower controller saw sparks trailing behind the aircraft. He advised the pilot who stopped the bird on the runway. The crew deplaned and discovered that the right aft gear lower strut had dropped out of the upper strut and dragged on the runway.

This incident, which cost the Air Force more than $7,000, resulted from maintenance malpractice. The locking tab washer was not bent into the locking position, which allowed the gland nut to back off with subsequent separation of the lower strut.

The records showed that the aircraft had undergone two phase inspections since IRAN. During one of those inspections, work cards required use of a go-no-go gage. How well the individual complied with the work card requirements is questionable. Who signed off the work on the 781? Are QC reports to the commander reflecting the true quality of maintenance performed?

NEAR ACCIDENT

During go-around from a low approach, the IP and student in a T-37 heard an explosion in the right engine. The IP retarded the throttle to idle as smoke entered the cockpit and the overheat light illuminated. The fuel shut off "T" handle was pulled, the overheat light went out in approximately 20 seconds, and the IP made a single engine landing.

Turned out the tailpipe had come loose and was forced back against the interior of the nacelle. Closer examination revealed that the tailpipe clamp had been installed with its edge caught on the tailpipe flange. The clamp worked loose in flight and the tailpipe was forced aft by the exhaust gases, as shown in the accompanying photo.



COMMANDERS: *How conscientious are YOUR inspectors?*



NUCLEAR SAFETY AID STATION



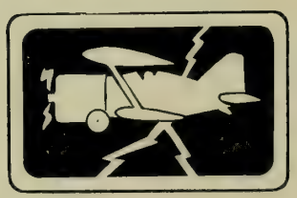
REPORT TWO-MAN POLICY DEVIATIONS

A two-man electrical-mechanical team with a security guard was performing routine maintenance at a Minuteman launch facility when the team chief fell from level one to level two of the launcher equipment room. He received serious head injuries and was removed from the silo and placed in the cab of the vehicle. The security guard remained with him while the assistant team chief reentered the launcher equipment room to secure the site. This was, of course, a valid deviation from the Two-Man Policy necessitated by the nature of the emergency. However, the Two-Man Policy **had** been violated and follow-on verification of the proper launch facility configuration should have been made. This was not accomplished until four days later, since neither the security guard nor the assistant crew chief reported the deviation at the time of the incident, and it only came to light during a subsequent investigation. Our people should be able to handle emergencies; however, we must not lose sight of the fact that we are dealing with nuclear weapons, and one of the keystones of the Nuclear Safety Program is based upon assurance that the Two-Man Policy will be strictly enforced.



THE HAZARDS OF WINTER DRIVING

In early December, at one of our northern Minute
man bases, a maintenance team was convoying a re
entry vehicle (R/V) from the support base to a launc
facility. While braking on an ice covered portion o
the highway, the maintenance van, one of the suppor
vehicles within the convoy, slid off the road onto th
shoulder. The shoulder then collapsed and the ve
hicle tilted onto its side. This necessitated haltin
the convoy and establishing a national defense are
for approximately two and a half hours until a re
placement maintenance van and team could be dis
patched. It seems as inevitable as the coming o
winter itself that incidents of this nature will occu
The importance of driving carefully when driving con
ditions are hazardous cannot be overemphasized.



HIGH POWERED AIRPLANE

What happens when you apply 380 volts/50 hert
power to a 115 volt/400 hertz aircraft system? In a
least one system it causes computers, heaters, an
plifiers, and lights to produce varying quantities o
smoke from both A.C. and D.C. sources. Fortunately
all switches in the nuclear weapon monitor and con
trol system were off and no serious problems resul
ed. What caused the problem? Basically it was huma
factors. The power receptacles are color coded bu
this one had just been replaced and was not painted
Normally there is a checklist attached to the powe
junction box but this time the checklist was missing
The 380 volt power source was no longer require
at the junction box but no one had taken the time t
have it removed. With all of these hazards the resu
can only be an occurrence in the Dull Sword or Ber
Spear category. Have you looked for such hazard
in your area? Reporting under AFR 127-6 could pre
vent problems reportable under AFR 127-4. ★

EXPLOSIVES SAFETY

for munitions, weapons, and egress techs

GUN CLEARING OPERATIONS CAN BE DANGEROUS

D. E. ENDSLEY, Directorate of Aerospace Safety

An airman was assigned to remove a jammed round of ammunition from a 20mm gun on an A-1E aircraft. The airman noted that the gun bolt was in the rear position and that the gun blocks were properly installed by the dearming crew. The pilot had turned all armament switches to the off and safe position. The airman then mounted the wing, opened the left outboard gun bay panel, and detorqued and removed the feeder. Upon checking the round of 20mm ammunition, he noted that the primer had not been dented. He then inserted a screwdriver in the extractor groove to determine if it could be removed. This procedure failed. He then tried it with a pair of channel lock pliers. Again no luck.

The NCOIC of the weapons loading crew suggested that a gun cleaning rod be used to extract the jammed round. The airman obtained an M-13 cleaning rod and had another airman insert it down the barrel of the gun while he observed the operation from the wing of the aircraft on the right side of the open gun panel. After several light taps with the cleaning rod the round popped out and struck the ejector which caused the round to explode. The airman observing the operation sustained a superficial chest wound.

This mishap caused the unit to revise its gun clearing checklist and provide padding to prevent 20mm round primers from striking the ejector. The approved knockout rod with appropriate limit marking will be used in future operations; during gun clearing of jammed rounds the gun bay door will be closed and personnel will be evacuated from the immediate area.

Have you checked your gun clearing procedures lately, and do you know your crewmembers respect the hazards related to 20mm ammunition?

INADVERTENTLY FIRED

DONALD S. LYON, OOAMA, Hill AFB, Utah

"The primary cause of this accident was that the weapons mechanic inadvertently actuated the aircraft rocket firing circuit with the aircraft in an armed configuration."

This finding is typical of those involving the personnel factor in explosive accidents. The word "inadvertently" is normally the phraseology that is used in explaining why some explosive item was damaged or destroyed.

In some cases it is hard to understand how this phraseology can be rationalized. It apparently is used to soften the findings, rather than say that the primary cause was a *flagrant violation of operating procedures.* A review of some accident reports bears this out:

- Qualified egress system mechanics were removing the left seat, and, due to poor lighting, were unable to insert the maintenance pin in the M3A1 initiator behind the seat. After several tries, they decided to remove the seat without a safety pin installed. While one of the mechanics was lifting the seat, he slipped, turned the seat into the initiator striking bar, and the propellant actuating items were *inadvertently* fired. Stated cause: Initiator linkage misaligned. The real cause: Blatant disregard of operating procedures.

- During synchronization check of guns on aircraft, an airman fired rockets which struck other aircraft. Primary cause: Mechanic inadvertently actuated the aircraft rocket firing circuit with the aircraft in an armed configuration. Real cause: The mechanic failed to follow directives while working on a hot aircraft. Too many accidents are caused by obvious violations of good, sound safety precautions contained in checklists and operating procedures. ★

THE CREW CHIEF

In your December 1971 issue you had an article on the Crew Chief. On behalf of thousands of crew chiefs around the world, I'd like to give you the Well Done Award. This article had to be the "Article of the Year", if only for the crew chief.

You're always reading of the mistakes the crew chief has made, but rarely do you read about the good he has done or the dedication he has. If only the next pilot who climbs into his aircraft and looks down at the greasy object below (the crew chief) would remember that that crew chief has been out in below zero weather, or swimming around the aircraft in a hurricane for some long, hard hours waiting for his pilot, and instead of saying to the crew chief, "You're a mess," a friendly "Good morning" would do.

I wish the article would be mandatory reading for all pilots. A person who has good morale will have an excellent product.

SSgt Rex G. Lawrence
APO New York 09020



MAIL CALL

WHAT IS IT?



Here are a few hints:

It was built in the late 40's.

Gross weight somewhere over 150,000 lbs.

Flew primarily out of Mobile, Alabama.

Belonged to MATS (MAC).

Bashed along for long distances at around 200 kts TAS.

One of the few aircraft that flew for any length of time in the USAF inventory where no fatalities were incurred.

Engines, wing and main gear used on a later model aircraft.

(Turn to back cover, lower right for answer)

☆ U.S. GOVERNMENT PRINTING OFFICE 1972 789-126/7

UNITED STATES AIR FORCE

WELL DONE AWARD

Presented for outstanding airmanship and professional performance during a hazardous situation and for a significant contribution to the United States Air Force Accident Prevention Program.

Staff Sergeant
THOMAS N. SNOW

Airman 1st Class
WILLARD L. AVERY

Airman 1st Class
DELANE E. FICKBOHM

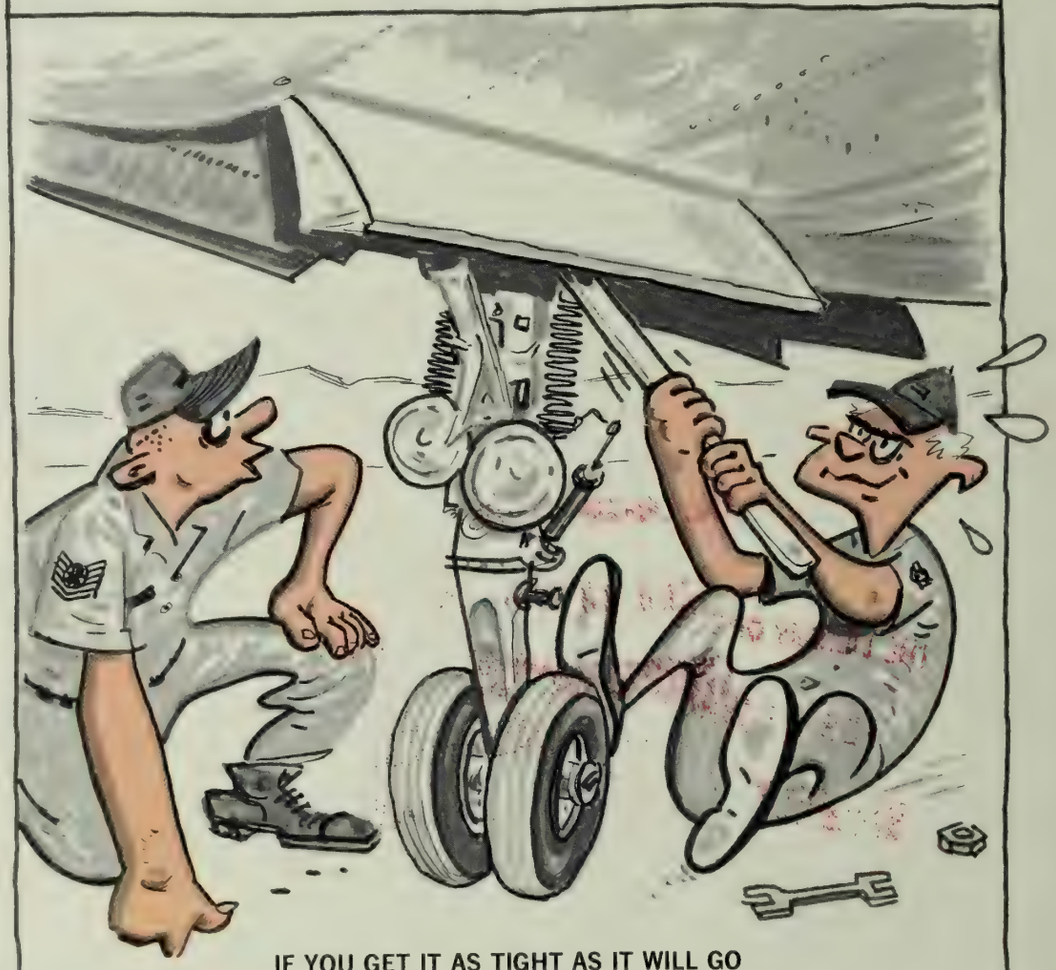


349th Munitions Maintenance Squadron, Holloman AFB, N.M.

On 3 May 1971 Sergeant Snow, Airman Avery, and Airman Fickbohm were performing as dearm crew at Holloman AFB, New Mexico, when they were confronted with a serious fuel fire endangering an aircraft and its crew. Just as an F-4D taxied into position for dearming, a small explosion occurred in the centerline fuel tank area. A considerable amount of fuel spilled onto the ground and immediately started burning. Sergeant Snow, Airman Avery, and Airman Fickbohm rushed a fire extinguisher to the aircraft and started combating the rapidly spreading fire. While the other two continued to fight the fire, Sergeant Snow assisted the aircrew in evacuating the aircraft and getting to safety. He then returned to assist with the fire extinguisher. The three men worked feverishly to keep the fire suppressed until help could arrive. Just as the small extinguisher became empty, base fire fighting vehicles pulled into position and extinguished the fire.

The quick actions of Sergeant Snow, Airman Avery, and Airman Fickbohm, while facing the possibility of a larger fuel explosion, undoubtedly saved the aircraft from total destruction and the aircrew from physical injury. WELL DONE! ★

HAVE YOU EVER SAID THIS?



IF YOU GET IT AS TIGHT AS IT WILL GO
AND THEN BACK OFF A LITTLE
IT OUGHT TO BE ABOUT RIGHT.

take time and find out what torque values are required

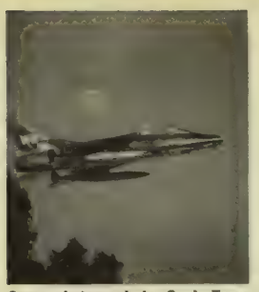
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FLYS

UNITED STATES AIR FORCE • APRIL 1972

Aerospace SAFETY



APR 24 1972



Cover photograph by S. J. Tannheimer, AAVS, Norton AFB, Calif.

UNITED STATES AIR FORCE APRIL 1972

Aerospace SAFETY

FOR AIRCREWS, MAINTENANCE & SUPPORT TECHNICIANS

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THE COMMANDER AND SAFETY



Major General Edward M. Nichols, Deputy Inspector General for Inspection and Safety from September 1969 through February 1972, retired 29 February. One of his last official acts was to express what we consider to be some very cogent thoughts on the role of management in accident prevention. Aerospace Safety *is pleased to present these to our readership, especially those in command and supervisory positions.*

During my very close association with inspection and safety over these past few years I have come to the firm conclusion that "command and its relationship to effective mission accomplishment" are basic to the success of any well run unit. Based upon hundreds of base and wing inspections, UEI teams have found that practically without exception it was the knowledgeable commanders who ran the efficient, well managed, and accident-free operations. By "knowledgeable" I mean that they had gained first-hand information by personal observation and from the management tools available within the various functional areas of their mission. They were able to measure performance, determine status, and take corrective action before the situation got out of hand and produced an accident.

There are internal management audits within each function on a base that will quickly reveal problem areas and overall effectiveness. Quality control and the management analysis section in maintenance, the stan/eval section in operations, and industrial engineering in civil engineering are but a few examples of internal management tools which a knowledgeable commander will use. For example, QC reports provide a review of daily activities, aircraft/missile condition, the job accomplishments in the maintenance complex; and from these can be ascertained work-force inequities and/or mistakes, training weaknesses, and supervisory deficiencies. The commander who is completely familiar with his stan/eval section can assign additional training, schedule his crews more selectively, or accept the toughest mission offered because of the confidence he has in the standards demanded of his pilots.

One thing for sure, no commander is going to get knowledgeable by sitting behind his desk reading and issuing memos. His presence is needed, because in addition to the self-education process, it also serves as an indication of his personal interest. And if he is interested enough to be down in the tire shop, motor pool, engine shop, sitting in on a stan/eval debriefing, or out on the ramp watching the work being done when it is dark and cold, you can bet that the rest of his supervisors will also be there—and with that type of supervision, things just don't go wrong!

In looking at command and its relationship to effective mission accomplishment, we must take cognizance of the fact that approximately 80 percent of the people and money available in support of the mission are in the logistics area. Yet this is where the average commander spends approximately 20 percent or less of his time. This isn't particularly surprising in view of the fact that few commanders have much experience and background in the logistic areas. For this reason I would strongly suggest that a reorientation of priorities by commanders is in order. Agreed, the mission is to fly and to fight. But behind the thunderous crack of the afterburner cutting in, there are the less glamorous aspects of running an outfit that are of direct concern to the commander if he is to achieve any degree of effective management. To a great extent, his knowledge of these less glamorous areas will have a tremendous influence on their management and effectiveness. If his influence is great enough, the end result can only be that the jobs are done right and economically—and if they are done right, they will be done safely. ★

Edward M. Nichols

Major General, USAF
Deputy Inspector General
for Inspection and Safety



go know go

TAKEOFF AND LANDING DATA CARD
CONDITIONS

	Takeoff	Landing
Runway length	_____	_____
Gross weight	_____	_____
Runway air temp	_____	_____
Press. alt	_____	_____
Surface wind	_____	_____
RCR	_____	_____
Headwind/crosswind component	_____	_____

TAKEOFF

P_t5 (normal)	_____		_____
P_t5 (anti-ice, as required)	_____		_____
Critical field length	_____		
†Takeoff: Dist	_____	Speed	_____
†Acceleration: Dist	_____	†Speed	_____
Safe 1 eng speed	_____	Decision Speed	_____
†Single eng takeoff speed	_____		

LANDING

	Immediately After Takeoff	Final Landing
Final approach speed	_____	_____
Landing dist	_____	_____
Safe 1 eng speed	_____	_____

†Takeoff items that need not be completed when the available runway is dry and exceeds critical field length by 2000 feet or more

It happened last year, the year before, and is happening this year. It's the type of problem that always happens to somebody else. (That's probably what the crews who were involved thought, too.) It's an accident spawned by complacency.

All of us have been guilty of this complacency at one time or another. It happens when we release the brakes for takeoff and become something of a passenger, until a glance at the airspeed tells us it's time to establish an angle of attack and go fly. Unfortunately, a lot of things in a machine can go haywire between

brake release and rotation. If we aren't paying real close attention, these things can end up in a mangled mess when appropriate action could have resulted in a no sweat abort.

Most of the problems seem to be the result of trying to stuff round pegs in square holes—pilots abort when they shouldn't or don't try to abort when they should.

One pilot was killed and the other seriously injured because the bird just didn't "feel" right. They were actually airborne, with the airspeed increasing, when the decision was made to put it back down and go for the barrier. The pilot in the rear seat ejected. His immediate assessment of a lost cause saved his life. The front seater elected to pursue this exercise in futility. He died.

Post accident investigation found no evidence of a malfunction that would cause the airplane to not "feel" just right. Based on the survivor's comments, the guess is that the pilot pulled the throttle off on a bird that probably would have flown. At any rate this action by the pilot guaranteed that something very unpleasant was going to happen. He was too fast for a successful engagement so the result had to be a wreck.

Another related type is the fire warning circuit, which almost never comes on before taxi or just after landing but always when you would least like to see it. Take the case of the pilot of a two-engine bird who noticed that red glow just about gear up time. Red warning lights in a cockpit call for immediate action, so he took action. Although the aircraft engines were powerful enough to fly with one shut down, the bird simply will not fly when one fails and you shut the remaining *good* engine down. How many fewer accidents would there have been had the pilot taken only five seconds to correctly interpret what was happening, rather than doing something instantly and possibly incorrectly. Sure some emergencies require rapid response so you have to decide, before it happens, if you are the type guy who can "play it cool" for a few seconds before taking corrective action.

An F-4 pilot was making a heavy weight takeoff when he decided to abort between 150-160 knots and after 3000 feet of roll. It turned out to be a routine abort, snagging the barrier at 50 knots.

After the dust settled a peek in the Dash One revealed that, for the weight of this particular bird, takeoff should have occurred after 4000 feet of roll and at 181 kts. Nose wheel liftoff speed was 160K. No wonder the bird didn't feel right—it wasn't ready to fly. It's rather obvious that nobody spent any time checking the takeoff data. This was a "lucky." Maybe next time the runway will be shorter, the air warmer or reactions by the pilot a bit slower. Any one or all of which could end up causing a broken machine.

How do we prevent a "routine" abort from developing into a flaming wreck? We can't say for sure, but we can safely say, where and when to abort generally will have to be decided before you mount up.

Would you believe that somebody went to a lot of trouble just to provide you with all those acceleration, stopping distance and critical field length charts found in most Dash Ones? If he properly uses those charts, a pilot can determine with a high degree of accuracy where decision points are along the takeoff roll. Unless you have these figures firmly fixed in your mind *before* brake release you have just let some of your life insurance lapse.

Don't sit back after reading this, fold your arms and dismiss the possibility that you will never find yourself in a predicament where the "abort" decision has to be made. The possibility of having to make a rapid decision at or near refusal speed is a fact of life that can happen to anyone. And there isn't any guarantee that, even if you plan carefully and have made all those necessary computations, you won't find yourself between a rock and a hard spot. What we are saying is that you will be much better prepared to determine the most *correct* course of action. After all, this is the only thing we can do in any emergency situation, so take out that extra bit of insurance and plan ahead for the day when you turn out to be the "other guy" that aborts always happen to. ★



HAIRY TALES

the hand is quicker than the brain

Two A-37s were making a night formation takeoff. As Lead took the active and called for the engine runup, he elected to leave his taxi light on for takeoff, thinking to himself that immediately after liftoff he would turn it off.

The brake release call was made and both aircraft accelerated to takeoff speed. During rotation the lead pilot reached up to turn the taxi light off, but instead of putting the landing/taxi light switch in the center or OFF position he moved it all the way up which turned the landing lights on. The wingman, knowing that the landing lights work in conjunction with gear retraction, saw the landing lights coming out of the wing and this was a signal to him that Lead was retracting his gear. Although the landing lights were extending rather than retracting, the signal was noted by the wingman who retracted *his* gear. Fortunately, he was airborne by a few inches.

To complicate the matter further, Lead, having made a motion with his left hand when reaching for the taxi light—similar to that of picking up the gear handle—then reached down and picked up the flaps without raising the gear. As he was accelerating to the gear limit speed of 150 KIAS, he checked the gear handle and indicator lights to assure that the gear was up and locked. This is normally indicated by the red light in the gear handle being out. When he saw the three green down-and-locked indicator lights, it signaled to him that the gear hadn't fully retracted and that he should recycle.

He radioed to his wingman that he was coming back on the power to recycle his gear. The wingman, now realizing that Lead's gear hadn't even started to retract, figured that Lead definitely had a gear malfunction and started to advise him to put the gear handle down and leave it alone instead of trying to recycle. Before the wingman could get it all out of his mouth, Lead reached for the gear handle and found it in the down position. The light dawned, and he raised the gear. After he calmed his wingman, the rest of the mission was flown in a rather uneventful manner.

Where would the fault lie had the wingman settled onto the runway? Flight discipline can become so ingrained that a wingman will follow Lead without question, especially if he has flown on his wing many times before. Complacency and habit patterns also enter in. The wingman, having many hours in the aircraft, reacted according to habit when he raised his gear, even though Lead's landing lights were extending rather than retracting. Lead, knowing he had to move the landing/taxi light switch up, merely flipped it up rather than insuring that he had put it in the Off position. Lead also failed to raise his gear because habit told him that after takeoff, you make one upward motion with your hand, and then pick up the flaps. His upward motion in this case, consisted of moving the landing/taxi lights switch, located above the gear handle, to the Up (landing light) position. When he checked for a gear up-and-locked indication, he saw three green lights which he knew shouldn't be there. These lights registered in his mind in the same manner as a red light in the gear handle.

Let's review some of Murphy's Laws.

- In any field of scientific endeavor, if something can go wrong, it will.
- Left to themselves, things will always go from bad to worse. ★

ELECTRICITY-SAFETY-AND THE MAINTENANCE MAN

Many Air Force people are exposed to electrical shock in performing their jobs, and we are all exposed in some degree in our homes. Last year there were six Air Force fatalities due to electrocution, four off the job, two on. This article, adapted from Lockheed California Company's Fighter Maintenance, *contains information that could save your life. We highly recommend it, regardless of your job.—Ed.*

If you have ever passed close to a high-tension power transmission line on a rainy day, a quiet pause near one of the support poles or towers would serve to make those "Danger—High Voltage" signs more meaningful. There is a hissing, buzzing, crackling sound from the wires where they pass over the insulators that sets the hair on end across the back of your neck—it *sounds* menacing, as it should. We've been taught, as part of our early training in this era of technology, to stay away from bare wires, especially those marked "High Voltage." We've seen movies with electric switchboards in submarines or the laboratories of "mad scientists" turning into fireworks displays as they overloaded or shorted out. In short, we are conditioned to think of high voltage electricity as dangerous, something to be treated with great respect even while we put it to work for us.

Of course, all this is true; if we are to stay alive, continuous caution is vital when we work around power stations, transmission lines, or distribution networks with high voltage potential. But most of the time, most of us deal with "low voltage" electrical equipment which operates on power stepped down by transformers from high voltage sources that are *safely removed,* we believe, from our work stations. We think that because the "high voltage" menace stops at the transformer station, or at the outside of the hangar, we are safe from electric shock—all we're exposed to is 220 or 110 volts alternating current, something we live with every day around the hangar or the house, something the wife can use to wash clothes or vacuum-clean the rugs. So each day, someone who feels "safe," someone who is complacent about "harmless low voltage" is injured or killed because he didn't obey the most fundamental rule for working safely with electricity—*"Never allow your body to offer a path for current flow."* Because it is *current* flowing through the body, *not voltage,* that determines the severity of an electric shock.

When the body is in a position to offer a path for the flow of current, the amount of current which will flow depends upon only two factors—the *resistance* offered by the body, and the *voltage available to push current* through that resistance. We often hear of cases where *low voltage* proved to be a killer because the resistance of the victim's body was *low enough to allow*

heavy current flow through vital organs, or to cause fatal internal burns. On the other hand, some people have escaped the hazards of *higher* voltage shock solely because their bodies offered *too much resistance* to current flow. Since resistance is so important to survival, we should find out how it varies in the human body, and what effect these variations may have in prevention of electrical shock.

RESISTANCE VERSUS VOLTAGE

Figure 1 illustrates how resistance to current flow through the surface of the skin can vary according to circumstances. Careful study of this chart should leave you with the knowledge that *you can exercise control* over the total amount of resistance to shock when you touch a source of electrical potential. For example, if you keep your skin dry and if while grounded you touch the source lightly with your fingertip (only one-half of a square inch), the resistance to current flow may be as high as 400,000 ohms, and you probably will not feel even the slightest tingle of the shock sensation. But the chart shows much different resistance values on the "WET" side.

To demonstrate this, let's say you've been working hard on a hot day in the unventilated insides of your airplane, and you're sweating heavily. When you grasp anything fully with a wet hand, the increased contact area (up to 15 square inches) combines with the increased conductivity of the moist skin to lower your resistance at the area of contact to as little as 1000 ohms. Should the object you're grasping be a source of electrical potential like the metal case of a defective and improperly grounded electric drill motor, current will flow through your hand, arm or body at the instant you touch another object at ground potential. The shock could be very severe or perhaps fatal, *even if the voltage is relatively "low,"* as you can see by looking at Figure 2. For example, at 100 volts of 60-cycle alternating current and only 1000 ohms resistance, the current flow in most circumstances could be more than 100 milliamperes, and *you couldn't let go or even move a muscle* while the current continued to surge through your body. It takes only one-tenth this much current flow (10 milliamperes) to "freeze" your muscles and thus keep your body in the circuit until it is deenergized.

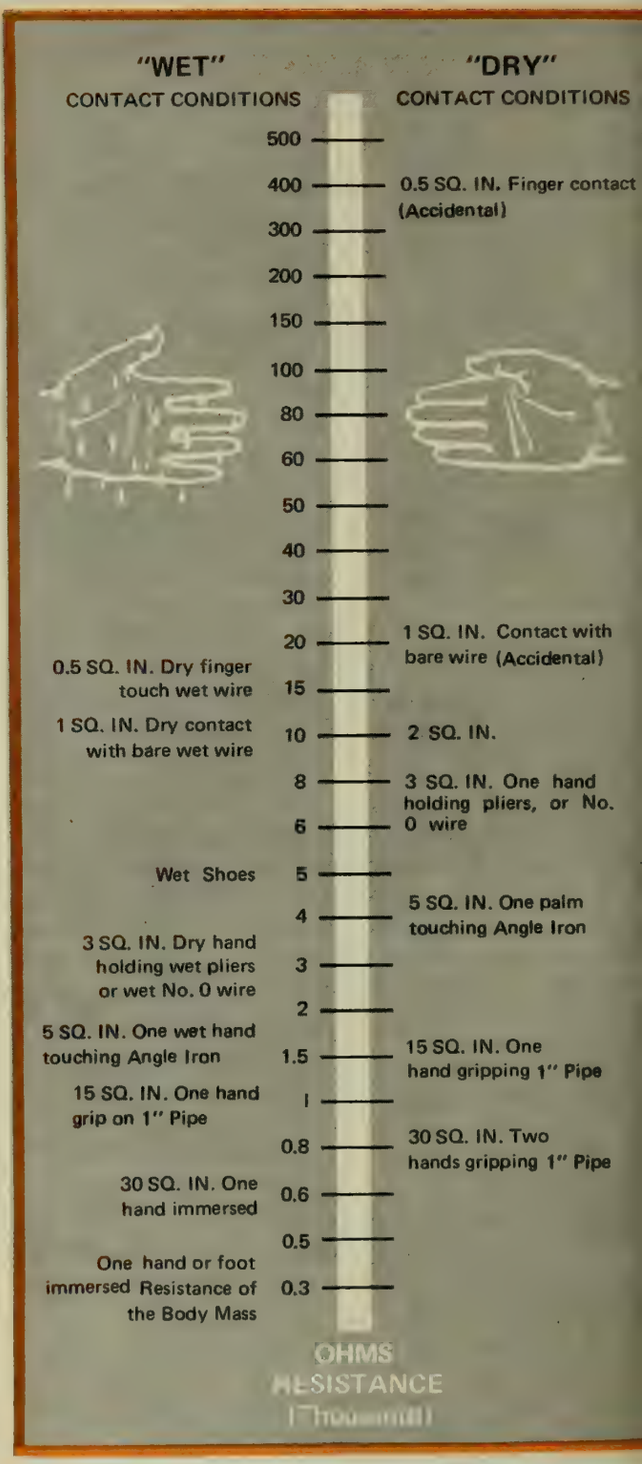


Figure 1 Variable resistance of typical body contacts

HOW RESISTANCE VARIES Having looked at the illustrations and the big numbers along the scales, you may still feel that you wouldn't risk much from shock hazards in the type of work you do or the kind of equipment you normally work with. But you should have learned by now, at least, that the resistance of the human body *cannot be relied upon* to prevent a fatal shock from 115-Volt or even lower voltage circuits. And this is because of the extreme variations in body resistance, almost all of them confined to the external area.

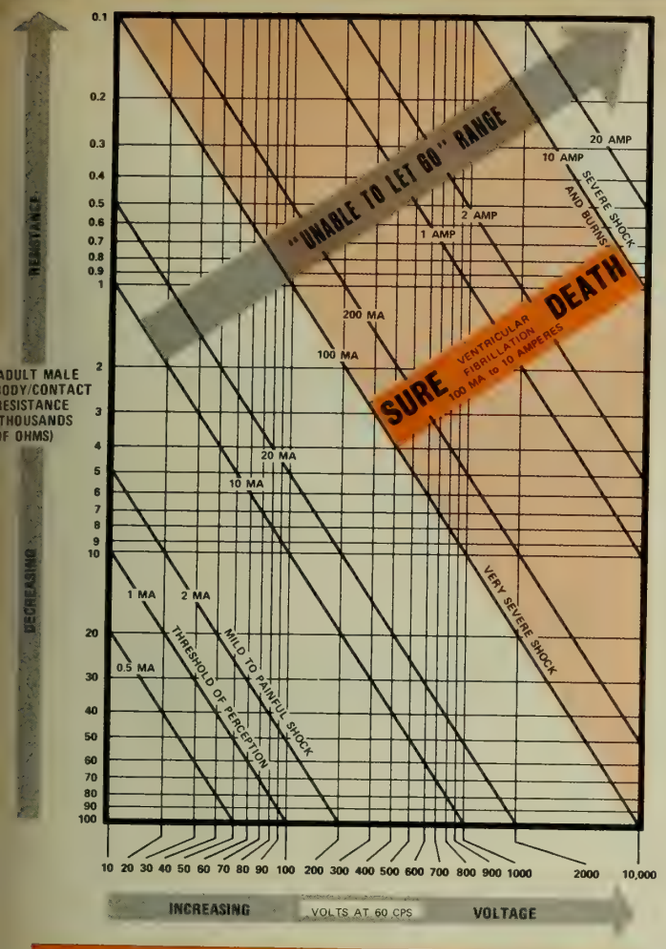


Figure 2 Electric shock hazard—adult males

The internal resistance of the body is relatively constant and relatively low. We are all, inside of us, about 85 per cent water, an excellent and low impedance conductor. Conditions under the inner layers of the skin stay just about the same all the time, so that to find the causes for the variables in body resistance we must look at the skin, and what's in it and on it.

Body skin is made up of two major layers. You already know that dry skin has relatively high resistance, especially if it is thick, such as in the area of a callous. But the inner layer of skin is naturally moist, due to the contact with body fluids, so resistance to current flow falls off rapidly if the inner layers are exposed, or *if body fluids come closer to the surface,* as when a blister forms. And blisters do form in seconds, from *localized heating* when current flows either along the surface of the skin or through a portion of the body, as shown in Figure 3. The effect is cumulative—current flow through skin resistance causes heating, the heating brings moisture to the surface, blisters full of fluid lower the resistance even further, so the current flow increases, producing still more heat, etc. Your total body resistance might be pretty high to begin with, before you suffer a shock. Then as the skin resistance goes down, your total body resistance decays rapidly. And the longer it continues, as shown in this example, the worse it gets. *In three seconds,* while your internal resistance stays constant at only 300 ohms, your skin resistance plunges from 2000 ohms down to 200 ohms, while current flow zooms from 50 milliamperes to 230 MA. And all this time *you can't let go* to stop the vicious circle from completing itself.

Two hundred thirty milliamperes of current flowing through your body through the region of the heart is well within the band of current flows (marked on our chart in Figure 2) labeled "SURE DEATH"—the area where the heart stops pumping and just trembles ineffectually (ventricular fibrillation). Naturally, the effect of current flow on your body varies not only with its intensity but also with the path it follows. Figure 4 shows the five major flow paths through the body and the areas, shaded in red, that are affected most by the damage resulting from the shock.

EFFECTS OF SHOCK

To get an idea of the effects of so-called "low-voltage" shock, let's see what happens when 60-cycle alternating current at 110 Volts passes through a man from hand-to-hand or hand-to-foot. As current flow gradually increases, the following effects become apparent:

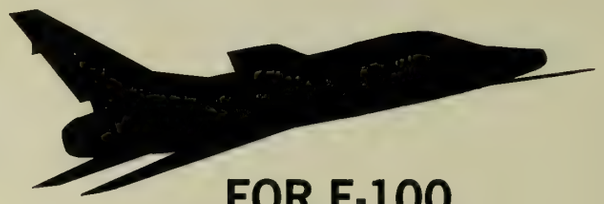
1 to 8 MILLIAMPERES—a sensation of shock, not very painful. A man can still let go because muscle control is not lost.

8 to 15 MILLIAMPERES—painful shock, but still he can let go. The hazard up through this amount of current flow often comes from the so-called "fright reaction" or recoil when the shock occurs. Men have fallen from ladders and other high locations, or have bumped their heads hard enough to cause unconsciousness, increasing the possibility of remaining in the path of current flow, prolonging the exposure.

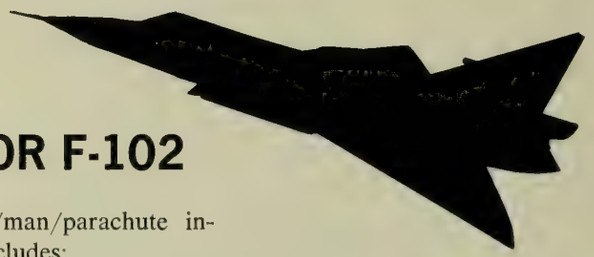
15 to 20 MILLIAMPERES—loss of muscle control begins, and the man *cannot let go* in spite of the painful

Continued on page 26

egress systems update



FOR F-100



FOR F-102

The Air Force has an ambitious program to update a number of older egress systems. It began in 1969 with the formation of an Egress Task Group Review Team consisting of representatives from the Airframe and Life Support systems managers, the Directorate of Aerospace Safety and the using commands. Every type of aircraft with an automatic aircrew egress system was scrutinized, requirements determined and recommendations for improvements established.

As a result of that review a number of update programs have been developed. In this and following articles in *Aerospace Safety* these programs will be described to inform primarily aircrews what to expect for their aircraft. This article will cover the Stencel-DART, snubber and parachute spreading gun system developed for the F-100 and F-102. Other articles in this series will cover the F-104, A-7, B-57, T-38/F-5, F-101, F-105, and T-33. Modification of the F-102 has been completed and work on the F-100 has begun. A similar package with some additions is being considered for the F-101.

The Stencel-DART, snubber and parachute spreading gun system was designed to provide shorter total system operation time and eliminate the problems associated with instability and seat/man/parachute interference. It includes:

- Seat-man stabilization during rocket burn
- Positive seat-man separation
- Positive and predictable canopy deployment
- Rapid canopy inflation.

What makes this system unique are the methods employed to accomplish these features. Stabilization during rocket burn is accomplished by nylon sliplines attached to the aircraft and connected to the seat through brakes fitted to the underside of the seat.

Two other lines, 60 feet long with an additional 15-20 foot stretch, act as a snubber to separate the man and the seat. Another new feature is a ballistic main canopy spreader activated by a lanyard attached to one of the risers. Two additional features have been added for the F-100: a ballistic inertial reel and single motion actuation of the system.

This system is fast—2.5 to less than 4 seconds from initiation to a fully opened canopy (Figure 1). Contrast this with the 6 or 7 seconds and up that were considered fast only a few years ago. However, we want to emphasize that this is not a license to deliberately push the system to the limits of its capability. While the system provides an extra margin, and may save your life under extreme conditions, when possible stick with the Dash One figures for your aircraft.

Briefly, the system operates as follows: The DART (Directional Automatic Realignment of Trajectory), composed of a braking device and four nylon sliplines, provides

FIG 1

EVENT	TIME
Trigger Squeezed	0.000
Catapult Starts	0.005
Catapult Separates	0.170
DART Starts	0.3
Rocket Burnout	0.8
Seat-Man Separation	1.0
Snubbing	1.2
EPC Inflated	1.60
Pack Opens	1.80
Spreading	2.90
Inflation	3.70

seat stabilization. As the lines play out through the brake during rocket burn, the lines sense seat movement in pitch and roll. Any adverse movement of the seat, when sensed, causes the DART to force the seat back to the upright position by changing the point of tension application. Meanwhile, the snubbing lines are also playing out. These are two high strength nylon cords whose function is to stop the seat's upward motion and positively separate the seat from the man. This will effectively eliminate the age-old problem of the seat catching up to and striking the pilot or becoming entangled with the chute.

At rocket burnout the snubbing lines cause a no-delay initiator to fire which opens the lap belt just prior to seat-man separation. (The one-second delay initiator for lap belt opening in the original system has been retained as a backup.) Further playout of the snubbing lines starts slowing the seat, with full snubbing coming at final line stretch just after seat-man separation.



FIG 2 Parachute spreader gun; the one on left has been activated. Note extended pistons that deploy slugs which spread parachute canopy.

During separation the parachute is activated through the "gold key" attachment to the lap belt, which releases an external pilot chute. This is a tri-mode system with high and low speed external pilot chutes as well as an internal pilot chute.

In either high or low speed modes, the external pilot chute serves two functions: It tends to orient the man for straight downstream deployment of the main parachute canopy, and it enables rapid extraction of the main canopy to line stretch.

If the external pilot chutes were to fail the parachute would deploy normally with its internal pilot chute.

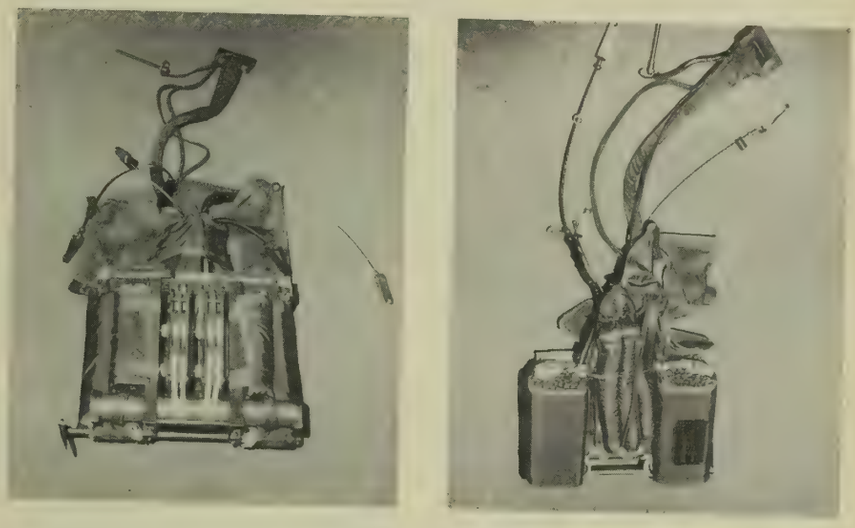
Just prior to line stretch, the main canopy spreader gun (Figure 2) is fired by a lanyard attached to one of the risers, which provides high speed opening. If the gun should fail, the canopy will open aerodynamically.

This briefly is the Stencel-DART snubber and spreading gun system for the F-100 and F-102. While it is new to the Air Force, a similar system has been used by the Navy since 1968. Their experience covers 65 ejections, including 30 below 500 feet. Twenty-six of the 30 were successful, and it is reported that at least nine would not have made it without the capability afforded by this system.

This is just an introduction. Learn the system for your aircraft. Read about it in your Dash One. Talk to your local life support equipment people. Then if you still have questions, call or write to the Life Support System Manager expert at Kelly AFB.

This system provides a greater margin for the aircrew in an emergency. But no system can save you if operated outside its envelope. Studies of USAF ejection experience have shown that the decision to eject has been influenced by the capability of the system. When an escape system has been modified to improve its low level capability, an accompanying increase in attempted use at the lower extreme of the envelope has been noted. Further, the studies disclosed that delay in the decision to eject continues to be a major factor in ejection fatalities. The implication is apparent: the decision must be made and executed within the envelope of the egress system.

When you need it, give the system a chance to save you. Above all don't make the fatal mistake of delaying your decision to eject based on the erroneous belief that, because you have a better system, you should wait longer before you go. ★

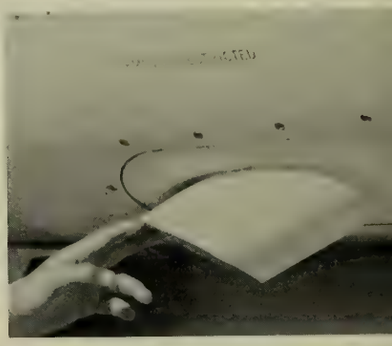


Left above, DART brake system on underside of seat. Right, stowage of snubber lines on each side of underside of seat.

SERVICING hazards -- A-7D









CAPT ALLAN V. SHUKLE, 354th Tactical Fighter Wing
Myrtle Beach AFB, South Carolina





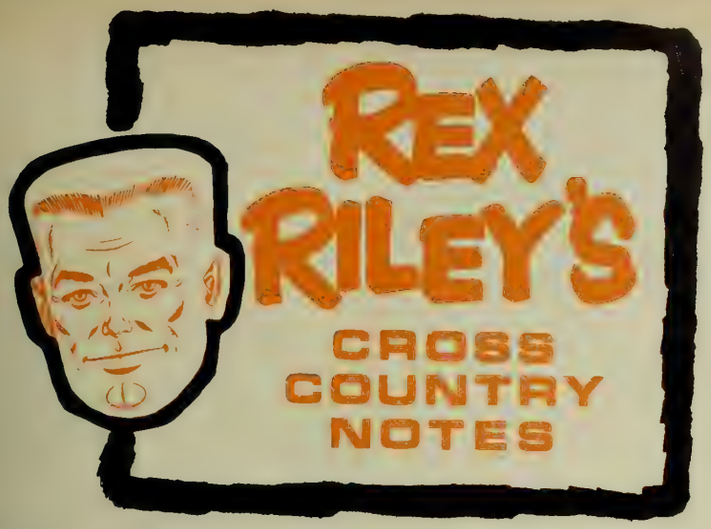
The A-7D has been in the Air Force inventory now for two years. It has reached operational status, and will be seen throughout the United States. As in any new aircraft, the A-7D design features pose certain safety hazards, especially for transient maintenance people who are not familiar with the aircraft. Some of these hazards are shown in the accompanying photographs.

The primary hazard areas during servicing or launching are in the wheel well areas. Due to their position, entry and exit to these areas require "ducking" or stooping. The sharp corners of the upper main landing gear doors can cause lacerations while the landing/taxi light in the right well could cause painful bruises (photo #1).

With the engine running, it is important that launch personnel stay near the nose gear when crossing under the aircraft intake to avoid the intake suction. In doing so, one can strike the aircraft's total temperature probe (photo #2) causing injury to the person and damage to the aircraft.

On the right side of the nose gea well, another danger exists. The ra air cooling duct (photo #3) exhaus hot bleed air during ground opera tion. This air heats the duct surfac to 240+°F.

The aircraft's pylons and win tips can also cause injuries. Th pylons have two danger areas; th sharp trailing edge and the swa braces (photos #4 and #5). drooping wing tip or aileron (phot #6) is low enough to cause hea injuries. (Photo subjects are 5'8 and 6'0" tall respectively.) ★



Base Ops Officers: How long has it been since you have taken a look at what the Enroute Supplement says about your base? Some transient fighter pilots have complained that they have found that some bases do not have what they advertise and on several occasions had equipment that they did not list. It is possible that this is an oversight, but it may also be that the idea is to discourage some types of transient traffic. Take a good look at what you are telling the world in your remarks section. Does it need to be updated or clarified?

Updating Info: There is no argument that each base has to have some method of monitoring the movement of their airplanes and to keep the pilots informed about the status of the air patch or about deteriorating weather conditions. I'm wondering, however, if procedures are clearly established which will insure that inbound transient pilots get the word as well. Just because the transient doesn't belong to you doesn't mean that the SOF, Base Ops or command center can't help prevent a nasty situation or avert a disaster.

Qualification: How to qualify for the Rex Award is still the most frequently asked question. The easiest way to answer is "do your transient facilities provide the kind of service that will make the transient leave your base with a smile and a feeling that he was glad he stopped there?" If they don't, it's likely that Rex will hear about it. Comments, both good and bad, are kept on file and are the major indicator as to how a particular base is doing. If you are so close to the situation you can't be objective about your own evaluation, my advice is to insure that each transient completes a transient questionnaire. Then you can spot problem areas and nip them early.

Comment from a transient: . . . "Every single person with whom we came in contact displayed a "can-do" attitude and went about their business in a most pleasant manner. We were made to feel like special guests and the Scott people appeared to enjoy helping us—from the supervisors down to the 'wrench-benders' and drivers. All too often, performance such as theirs goes unrewarded because excellence on the job is expected. I hope that everyone involved with us at Scott knows that the crew and passengers of 'Utah 27' appreciated everything done for them. They all reflected credit on their commanders and Military Airlift Command.

"Rex, I hope that your award will continue to inspire this type of performance. Scott truly represents the total base concept you so often discuss in your column, and they richly deserve to hang your award in their trophy room."

—Nice going, Scott! ★



REX RILEY
Transient Services Award

LORING AFB	Limestone, Me.
McCLELLAN AFB	Sacramento, Calif.
MAXWELL AFB	Montgomery, Ala.
HAMILTON AFB	Ignacio, Calif.
SCOTT AFB	Belleville, Ill.
RAMEY AFB	Puerto Rico
McCHORD AFB	Tacoma, Wash.
MYRTLE BEACH AFB	Myrtle Beach, S.C.
EGLIN AFB	Valparaiso, Fla.
FORBES AFB	Topeka, Kans.
MATHER AFB	Sacramento, Calif.
LAJES FIELD	Azores
SHEPPARD AFB	Wichita Falls, Tex.
MARCH AFB	Riverside, Calif.
GRISSOM AFB	Peru, Ind.
CANNON AFB	Clovis, N.M.
LUKE AFB	Phoenix, Ariz.
RANDOLPH AFB	San Antonio, Tex.
ROBINS AFB	Warner Robins, Ga.
TINKER AFB	Oklahoma City, Okla.
HILL AFB	Ogden, Utah
YOKOTA AB	Japan
SEYMOUR JOHNSON AFB	Goldsboro, N.C.
ENGLAND AFB	Alexandria, La.
KADENA AB	Okinawa
ELMENDORF AFB	Alaska
PETERSON FIELD	Colorado Springs, Colo
RAMSTEIN AB	Germany
SHAW AFB	Sumter, S.C.
LITTLE ROCK AFB	Jacksonville, Ark.
TORREJON AB	Spain
TYNDALL AFB	Panama City, Fla.
OFFUTT AFB	Omaha, Nebr.
McCONNELL AFB	Wichita, Kans.
NORTON AFB	San Bernardino, Calif.
BARKSDALE AFB	Shreveport, La.
KIRTLAND AFB	Albuquerque, N.M.
BUCKLEY ANG BASE	Aurora, Colo.
RICHARDS-GEBAUR AFB	Grandview, Mo.
RAF MILDENHALL	U.K.

THE I.P.I.S. APPROACH

By the USAF Instrument Pilot Instructor School, (ATC) Randolph AFB, Texas

ON COURSE

AFM 51-37, *Instrument Flying*, uses the term "on course" in many different situations. Quite often certain pilot actions are predicated upon being *on course*. For example, when performing a procedure turn from a fix that does not provide bearing information (outer marker, DME fix, etc.), you may not descend below the procedure turn completion altitude until *on course* inbound. The USAF IPIS is often asked for an interpretation of the term "on course."

This problem of interpretation is not limited to one situation. AFM 60-16, paragraph 8-12, requires pilots operating in controlled airspace under IFR to fly the center line of airways and the direct course between navaids or fixes defining the route. This is a rather all-inclusive statement requiring all pilots to fly *on course*. How close must you be to consider yourself on course when flying an airway or a jet route?

This problem assumes greater importance during instrument approaches due to the reduced obstacle clearance in this phase of flight. Any deviation from *on course* reduces the chances of being able to make a normal landing from the approach. This is particularly important when the missed approach point is a fairly large distance from the navaid. Five degrees off course at the maximum allowable distance of 30 NM would place the aircraft 2½ miles from the missed approach point, possibly out of sight of the landing runway. What is the acceptable deviation when flying an instrument approach?

On course can be defined as follows: The aircraft can be considered to be *on course* when, with the desired course selected, the CDI is aligned with the center reference of the course indicator/HSI, or, in the case of RMI-only equipment, the bearing pointer is aligned with the desired bearing. Before you judge this definition as too restrictive, consider the following:

The system accuracy of VOR and TACAN navigation systems is determined by the combination of ground station error, airborne receiver error, and pilotage error. Long experience in the use of these systems has shown that there is at least a 95 percent probability of an accuracy of ± 4.5 degrees or less. The 4.5 degree system accuracy of VOR can be seen in the 4.5 degree expansion of airways when the distance from the navaid providing course guidance exceeds 51 NM. This system accuracy is only achieved when the pilot is attempting to fly *exactly on course*. Any assumption by the pilot that he can accept a certain course deviation as "close enough" will only serve to degrade the system accuracy and reduce the probability that he will remain within primary protected airspace.

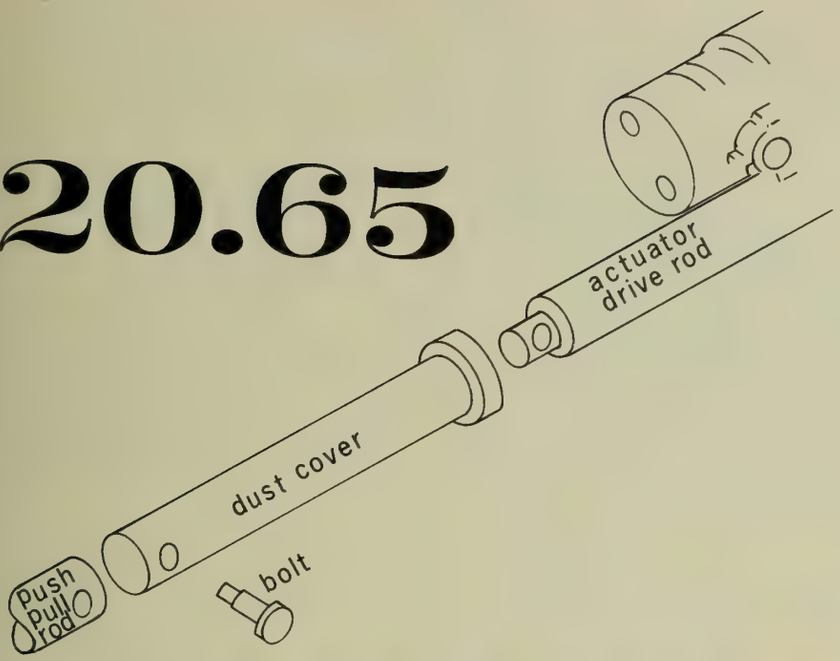
NOTE: If that 95 percent figure bothers you, you should realize that secondary areas are established adjacent to primary areas in order to provide a virtual 100 percent statistical probability of obstacle clearance.

AFM 51-37 permits descent below a penetration turn completion altitude when the aircraft is within 5 degrees of the inbound course. It also permits descent below a procedure turn completion altitude when the aircraft is within 10 degrees of the inbound course, if the procedure turn fix provides outbound course guidance. Neither of these criteria for descent should be considered as definitions of *on course*. In both cases airspace is provided which is much larger than that determined solely by system accuracy. To apply the definition of *on course* in these situations would be overly restrictive.

It is unrealistic to expect every pilot to fly his aircraft exactly on course 100 percent of the time. How far can he deviate from on course and still be considered as qualified? This is a question primarily of individual aircraft capabilities and pilot proficiency. Your major air command should establish tolerances for flight evaluations which take into account the factors peculiar to your particular aircraft and mission.

The best means the pilot has of assuring proper obstacle clearance is to fly his assigned route of flight as accurately as possible by attempting to maintain precise indications of *on course*. Instructor pilots and flight examiners must gage that performance against command-established tolerances in order to determine pilot qualification. All pilots must be immediately aware of any tendency to accept a certain course deviation as "close enough" and should take appropriate action to correct such a trend. Anyone flying an airplane should not be satisfied with anything less than his absolute best level of performance. ★

$20.65



WHY BOTHER?

This true story is about an incident that cost the Air Force $20.65 in labor and parts to make a repair. That's not much, is it? Why bother? Why use this space for something so trivial? Let's see what happened before we answer.

The aircraft was a T-33 on a functional check flight. Just after becoming airborne, the bird abruptly rolled left to nearly 90 degrees. The pilot used aileron and retracted the flaps to gain control. He then climbed to 15,000 feet where he made a controllability check. Subsequently, he made a no-flap landing without incident.

Would you believe that this little thriller resulted from confusion over the location of attachment holes in a dust cover between the flap actuator and the flap push-pull rod? When the flap actuator jackscrew was lubricated, the dust cover was replaced by one listed as an acceptable substitute. It differed from the original in that it had only an inspection hole ¾ inch from the end and no mounting holes at ¼ inch from the end. The mechanic drilled another hole opposite the inspection hole so that he could insert the attach bolt.

The problem then was that the bolt could be inserted in the wrong place—between the actuator and the end of the push-pull rod (as illustrated). Unfortunately, if one does not consult the tech data, it is easy to install a bolt that does not attach anything. It becomes merely a link between the two sides of the dust cover. It would look good but it would be worthless.

Now, because of the tight fit of the dust cover, the flaps could ground check okay; they did in this case. However, when air loads were applied on takeoff the right flap retracted.

Similar mistakes are made all too frequently. Sometimes an inspector catches the error and it is repaired before it can cause trouble. On other occasions we find out about it from incident or accident reports. The question is "how do we prevent these errors from occurring in the first place?"

To begin with, we must know that replacement parts are frequently not identical to original parts. Generally these differences are minor, but sometimes, as in the case of our dust cover, modifications are necessary. This requires careful reference to the tech data. A guess is not good enough.

To go back to our question in the first paragraph. Does this incident now seem trivial? Many errors as easy to make as this eventually end up as major aircraft accidents. ★



new tech data *for* phantom fixers

The start of another day. At the far end of the runway a cloud of black smoke marked a flight of two F-4s running up for takeoff. Seconds later, the roar of the jet engines slammed against the maintenance hangar, bounced back and forth between buildings and set up a sympathetic vibration through the walls of Maintenance Control.

The Maintenance Officer drew his first cup of coffee and walked into the control room. He stared at the status board for several seconds, then frowned at something that displeased him.

"What's the story on seven-eleven?"

The NCO at the center console looked up. "Sir, we don't know yet —it won't take fuel. We've had a team on it for an hour and a half."

The Maintenance Officer growled and dived for his desk, rummaged around in his bottom drawer and pulled out a small green book. After a few moments of study he got up and walked back to the control board.

"Call the team on 711," he told the NCO on the board. "Ask them to check the refuel relay circuit."

The sergeant put the call through and the boss headed back to his desk, shaking his head at the pile of paperwork which had already accumulated.

A few minutes later the sergeant came in. "They replaced that relay, sir—it's taking fuel okay now. Be ready to go in 30 minutes."

* * *

The little green book the Maintenance Officer grabbed for was a McDonnell Douglas product support troubleshooting guide—a very effi-

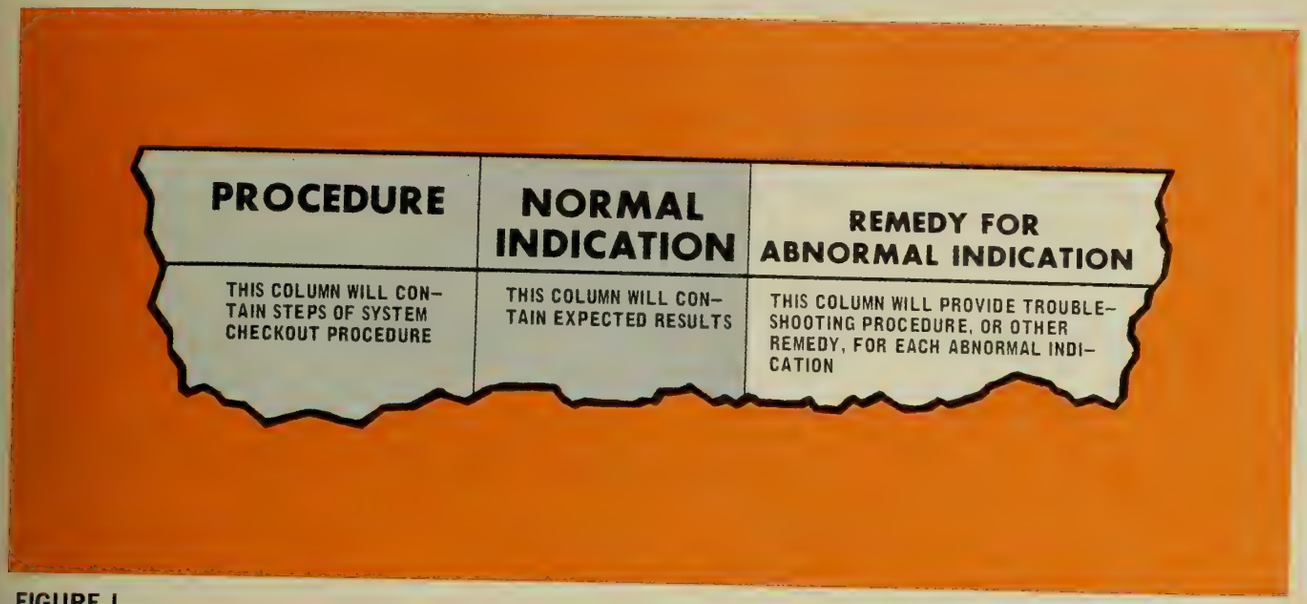


FIGURE 1

cient (but very unofficial) maintenance aid. Now wouldn't it be great if our TO library contained something like that? Have faith! Help is on the way, and that handy troubleshooting guide is only part of the story!

Help is coming in two forms: First, there is a program of TO *separation,* wherein each series aircraft (F-4C, RF-4C, F-4D and F-4E) will have its own tech orders; this will allow a massive decrease in the number of flag notes and cross-references, and will make the TOs considerably more usable. Second, there is a program of TO *improvement,* aimed at three major target areas: Checkout Procedures, System Schematics and Troubleshooting.

SEPARATION

. . . is going to involve a lot more shelf space, especially for units with more than one series of aircraft. TO librarians are well advised to make plans accordingly. Changes are planned for the following manuals:

- Separate Organizational Maintenance manuals (Dash Two series) will be provided for each aircraft series.

- The Field Level Structural Repair manual (1F-4C-3-1) will appear as a six-volume set.

- The Illustrated Parts Breakdown (Dash Four series) will separate the RF-4C data from the F-4C/D data.

IMPROVEMENT

Unified Checkout and Troubleshooting procedures: At present, checkout procedures and troubleshooting procedures are separated by many pages. Once a checkout procedure indicates a malfunction, the mechanic must go to a different part of the book to find the troubleshooting procedures. Improvement will take the form of a simple format change which will add another column, "remedy for abnormal indication," to the same page which contains the checkout procedure steps (see Figure 1).

Improved System Schematics: Emphasis has been placed on making the schematics easier to understand and follow, with the user in mind. Some improved features are . . .

- Actual drawings of components and/or location information. System components are not portrayed as simple "blocks" which have no relation to the actual size, shape or location of the actual component.

- The new schematics will contain the consolidated interface connection between the aircraft and the test equipment. Many schematics also provide functional information which tells the technician what the test equipment is checking and where.

- A more-detailed breakdown of the system by modes, functions or conditions, which will enable better understanding and troubleshooting of the entire system.

- Better system definition through the integration of electrical, mechanical, hydraulic and pneumat-

ic portions of systems. If a system is sufficiently complex, follow-on schematics are provided.

• The improved schematics will provide simplified signal/functional flow, enabling the technician to follow the system operation.

• Actual faces of indicators are included on the schematic, as well as any knobs, levers or handles which have a peculiar physical appearance. This should eliminate much confusion and give significant help to OJT programs.

. . . In sum, the schematics are designed to give the user—the technician—all the help possible. Wherever possible, relevant data is included right on the schematic, and the total design more closely duplicates the design of the aircraft system the schematic pertains to.

MASTER TROUBLESHOOTING MANUAL (1F-4(X)-2-34)

The Dash-34 is the official counterpart of that little green book mentioned earlier, and should make life a lot easier for all of us. It features comprehensive symptom indexes, arranged by aircraft system. But the easiest way to explain it is to take you through a sample problem.

Let's say that the pilot has landed his bird and made the following write-up in the forms: "No stall warning tone in forward cockpit." The technician grabs his Dash-34 and proceeds as follows:

(1) Turning to the master list of system indexes, he looks up "Stall Warning System." The master list refers him to Figure 2-6, the Stall Warning System Index of Symptoms.

(2) Flipping over to Figure 2-6, he then scans the list of symptoms until he finds the symptom he's looking for: "No stall warning tone in forward cockpit." Opposite this system is the instruction to turn to paragraph 3-5.

(3) Here's pay dirt! Paragraph 3-5 lists step-by-step troubleshooting actions for isolating the malfunction and correcting it. It also identifies the troubleshooting schematic to be used in conjunction with these steps.

We hope using organizations will be allowed to order multiple copies of the Dash-34. These volumes are sure to see a lot of use!

There's a brief, broad-brush look at some of the things that are coming through the TO system. Much of the information and the examples above were taken from McDonnell Aircraft Company's *Product Support Digest,* Volume 18, 2d Quarter 1971; we gratefully acknowledge their help and refer interested persons to that issue for more information on the new TOs.

Some of the new TOs are already in the field, and the others are on the way, so get ready. Progress is coming! ★

LIFE SAVER

The Flight Surgeon occupying the back seat of the B-57 looked at his watch. It was 0415. The ordnance was dropped and the mission thus far was uneventful, although he felt extremely sleepy. This degree of drowsiness seemed rather profound and difficult to control, but he dismissed its significance after only briefly thinking about it. After all, who would not be sleepy at 0415.

As the plane climbed from its initial altitude of 20,000 feet he had a feeling of detachment, numbness and increased drowsiness. The instruments seemed to fuse into a blurry mass of meaningless dials. Time slowed to a crawl. The Flight Surgeon began to feel nauseated, uneasy and frightened by his inability to comprehend what was happening. His usually analytical mind seemingly could not function.

"How are you doing, doc?" the pilot up front asked.

"Don't feel too good," was the hesitant and slurry reply.

"Say, you sound bad! Check your blinker."

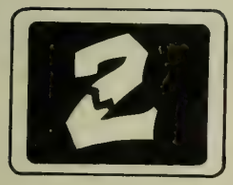
This, however, was not heard by the unconscious back-seater who was slumped in his seat.

The above is a true story. What was a "milk run" night mission could have become a tragedy. The victim did have a severe case of hypoxia. He survived only because the pilot astutely recognized it as such and descended to a lower altitude where the flight surgeon awoke to find his oxygen hose disconnected. At the initial cabin altitude of 14,000 feet the first symptoms of hypoxia appeared—the marked somnolescence—and went unrecognized only to become worse with higher altitude. By this time his mental faculties were too impaired to recognize the problem. This episode provides a lesson of value to all aircrewmen: *unusual, even very subtle, physiological symptoms, should be eyed with suspicion, and early recognition is vital.*

The training we receive is intended to provide the knowledge with which to solve problems. But knowledge not used becomes useless. That is why we have periodic refresher training, including physiological training. It is a life saver. ★

J. K. Richter, Capt MCFS, USAFR





TWO-MAN POLICY VIOLATION

Recently, at a missile launch complex, there was a Two-Man Policy violation that was not immediately reported, as required by AFR 127-4. The squadron commander detected the violation while reviewing a crew commander's report.

The launch control center, which is a no-lone zone, is an area from which one person would be capable of launching or directing the launch of a nuclear weapon or delivery vehicle, and must be occupied by two officers at all times. On this particular violation, the launch crew was alerted to a malfunction in another area of the control center. The crew commander proceeded alone to the other location to investigate the cause of the alarm, leaving the other officer alone at the launch controls. This procedure was contrary to established policy. The crew commander should have informed other members of the crew to check out the malfunction and therefore avoided the violation of the Two-Man Policy. Through the alertness of the squadron commander, a Dull Sword report was submitted in accordance with AFR 127-4.

The seriousness of this type of incident should be stressed. The strength of the Air Force Nuclear Safety Program is dependent on an effective Two-Man Policy.



RELEASE SYSTEM CONNECTOR MISMATCH

Within the last three months, two different bases have reported Dull Swords for identical deficiencies. A release system connector had been mated for conventional release when the aircraft was loaded with nuclear weapons. The fault was discovered during aircrew preflight following completion of loading procedures. Investigation indicated that the connector had been mated to the conventional system receptacle by a contractor depot modification team following completion of a time compliance technical order (TCTO). The TCTO procedures required a final system test that would have detected the fault. Command procedures also required the same test upon return of the aircraft from depot modification. Apparently neither of these tests was performed. This lack of compliance with procedures can be avoided by strict supervision and control.



CROWDED NO-LONE ZONE

A violation of the Two-Man Concept (AFR 122-4) occurred at a Minuteman launch facility, although six personnel—a Combat Targeting Team member and five members of an evaluation team—were present in the no-lone zone of the upper launcher equipment room.

There was a violation because the evaluators are not authorized to fulfill the SAC Two-Man Policy requirement. Apparently the criterion was not fully understood; no matter how many persons are in a no-lone zone, there must be at least two authorized persons who can positively detect incorrect procedures or unauthorized acts by anyone in the zone. This should be a special subject of predeparture briefings and the maintenance team chiefs must be especially alert to situations when personnel who are not authorized to fulfill the Two-Man Policy requirements are present. ★

A TIGER BY THE TAIL



LT COL SAM HENLEY, Directorate of Aerospace Safety

It was a cold clear day at a northern base when a "Twin Huey" (UH-IN) attempted to get airborne—without the crew! Impossible, you say? Not when you provide all the prerequisites for flight —except the pilot! Both fuel control switches were on, and both throttles were above flight idle. Couple this with a set of engine start switches in a position where they can be inadvertently actuated.

Let's stop at this point and go back to the beginning. The aircraft was down for maintenance due to removal of a UHF radio the previous day. The preflight crew had completed their work earlier. They had used the proper checklist (TO 1H-1(U)N-6WC-1) and completed all checks, which included a fuel boost pump check. In order to complete this step, the engine fuel control switches must be placed "on." A problem reveals itself at this point. The checklist does not require the switches to be placed "off."

Following the preflight, two radio repairmen arrived at the aircraft to install a UHF radio. They requested and were provided a crew chief to apply power to the aircraft. The first radio did not check out, so they returned to the shop. When they got back to the aircraft a second time, the crew chief had left the area for another job. They hooked up the APU and applied power to the aircraft. Again the radio failed to check out. The APU was shut off.

After a discussion with the line supervisor, they decided to remove a radio from another aircraft and use it for trouble shooting. Again, the crew chief was not available, so one man got into the left seat of the helicopter and the other man went to the APU and started it. When power was applied to the aircraft, the engines started and the bird immediately swung 90 degrees left and the tail rotor struck the top of an NF-1 light cart, shearing the 90-degree gear box output shaft. The aircraft rotation on the ramp was stopped at this point.

A nearby maintenance officer an the line supervisor ran to the air craft. While the maintenance office held the collective down, the lin supervisor got the engines shu down. Stopping the engines wa complicated by the fact that whe the APU was ripped away from th aircraft, electrical power was lost In order to rotate the throttles t the shutoff position, electrical powe is essential. The line supervis placed the fuel control switches of turned the battery switch on, an pulled the fire "T" handles.

This mishap was attributed to th radioman, who was wearing a bulk arctic parka and inadvertently actu ated the start switch on the IP pane The contributing causes reveale where the "real" problem lay.

(1) Fuel control switches left o

(2) Throttles left above flight idl

(3) No qualified crew chief a the aircraft while work was bein performed.

(4) Suspected faulty design of th start switch on the IP panel. ★

Ops topics

one more believer

Here's a story about a guy who did just about everything right and still ended up in a potentially bad situation. A stroke of luck averted the accident, but there's a real good moral built into the story.

He was an O-2A pilot, preparing to launch from a CONUS Army Air Field on a visual reconnaissance mission. He was mission conscious and safety conscious, so he had his tanks topped off and conducted a thorough preflight, including draining the fuel sumps and checking the fuel for proper coloration.

The fuel was the right color, all right—purple. But it seemed like a very light purple, so the pilot played it safe and sent the crew chief to make sure that the correct fuel had been delivered to the aircraft. The crew chief confirmed that a 115/145 avgas truck had been sent out.

Reassured—and after all, the fuel *was* the right color—the pilot completed his preflight and went on his way. Start, taxi, runup, takeoff and climb were normal and uneventful, and the pilot leveled off at 8500 feet.

About 15 minutes later the front engine began heating up; shortly thereafter the rear engine followed suit. Cylinder head and oil temperatures were still in the green but were both higher than normal. The pilot, evidently still spring-loaded to the CAUTION position, returned to base immediately and landed without incident.

On the ground he wrote up the discrepancy and insisted on having the fuel analyzed. It didn't take long to confirm that the 115/145 truck had really contained JP-4! Initial investigation indicates that the truck really was a 115/145 truck, but it had been filled from a mis-labeled bladder hose.

The pilot should be commended for his suspicious nature, and for getting the bird back on the ground at the first sign that things were going sour. And the moral, of course, is that a suspicious nature prolongs good health.

flip changes

Visual Approach: Visual Approach has been redefined as follows: An approach wherein an aircraft on an IFR flight plan, operating in VFR conditions *under the control of a radar facility* and having an air traffic control authorization, may deviate from the prescribed instrument approach procedure and proceed to the airport of destination by visual reference to the surface.

Identification of Heavy Jets: When the allowable gross takeoff weight of the aircraft is 300,000 pounds or more, enter the symbol "H/" as a prefix to the type aircraft designator in item 5 on the DD 175. Examples H/C-141, H/C-5.

radio failure squawk

The investigation of a recent accident revealed a misconception that is evidently widespread. Most of us think, it seems, that if we select Mode three, Code 7600, the radar agency working with us will be instantly alerted to our problem. This is not the case.

Selection of 7600 changes the radar display to a slash. In the high altitude structure the slash is easily seen by the controller, who can then interrogate 7600 to see if radio failure has occurred. At low altitude, however, the slash is easily lost among other returns and clutter. The controller may miss the change—and he won't be alerted to interrogate unless he's talking to you at the time the radio goes out.

So . . . in the event of radio failure, adhere to FLIP procedures. *Do not assume that your 7600 squawk has been received.*

Ops topics

CONTINUED

mystery clearance

A disturbing incident occurred recently when a commercial airliner, en route between two CONUS stops, received traffic clearances from an as yet unidentified source.

The first clearance occurred about 60 miles out from destination. The aircraft was at 11,000 feet, under Center control, when the crew received a weak but audible transmission directing the flight to descend to 1000 feet. The captain immediately asked Center for confirmation and was told that no such clearance had been issued.

A few moments later a second transmission came: "(Correct flight number) descend immediately to 1000 feet. Over." Again, the Center stated that no clearance had been issued.

The "mystery" clearances were not recorded on the Center's air/ground communication tapes, so the signal probably originated from a ground source below Center's line-of-sight. With no positive clues, further investigation will probably prove futile.

In this case, the spurious input was an irritant, nothing more. But put a pilot in the weather on an unfamiliar approach, throw in mountainous terrain, and there *could* be a problem of disastrous proportions! Except for radar approaches, during which we must read back all headings, altitudes and altimeter settings, there is no requirement to repeat ATC clearances unless requested to do so. But it is the responsibility of the pilot to confirm any clearance which is unclear to him, and to that we would add the desirability of confirming clearances which are unusual or of debatable safety—especially in the soup and close to the ground.

(Data from Flight Safety Foundation)

all it woulda took was ...a look in the book

The KC-135 was on a ferry mission in the CONUS Approaching destination they called the tower for current weather, which was given as 1300 broken, 2200 overcast, three miles with very light rain showers. By the end of the enroute descent, however, the weather had deteriorated to 1000 broken and one mile in heavy rain. The pilot requested a PAR, although no information for that type approach was published in the Enroute Supplement for that field. He was advised that PAR was out and that an ASR approach would be used.

On short final, RAPCON advised the crew that they were one mile out and asked if the runway lights were in sight. The copilot replied that they were; at this time the pilot went visual, observed that they were well right of the extended centerline and made rapid correction to align the airplane with the runway. Correction consisted of a rapid descending left turn, followed by a rapid descending right turn. The aircraft struck the runway in a right-wing-low attitude, seven to ten degrees left of the runway heading (as indicated by the indentations and skid marks left by number three and four engine pods).

This was sheer pressing, trying to salvage a bad approach—but it's even worse than it seems: testimony before the board revealed that no one on the crew was aware that minimum visibility for a KC-135 class aircraft (category E) on this approach was a mile and a quarter!

the evolution of an accident

Printed below are the findings in a recent accident, just as the investigator, in a remarkably competent analysis, reported them. A description of the accident itself seems almost superfluous.

PRIMARY CAUSE: Operator Factor in that the instructor pilot used improper braking techniques, which resulted in the failure of both main gear tires and the subsequent loss of directional control, causing the aircraft to leave the runway.

CONTRIBUTING CAUSES:

(1) Operator Factor in that the IP failed to slow his aircraft to recommended final approach airspeed.

(2) Supervisory Factor in that the element lead positioned the emergency aircraft on final approach at an airspeed well above the recommended final approach airspeed.

(3) Operator Factor in that the student pilot failed to detect the improper installation of the ignition circuit breaker panel during his preflight inspection.

(4) Maintenance Factor in that available tech data was not used, which resulted in the improper installation of the ignition circuit breaker panel. This allowed the left throttle cable and turnbuckle to chafe through the ignition circuit breaker wire bundle, causing an inflight electrical fire.

(5) Maintenance Factor in that failure to secure the ignition circuit breaker wire bundle properly permitted the ignition circuit breaker panel to be installed backwards.

(6) Design deficiency of the ignition panel circuit breaker panel in that it can easily be installed improperly.

There it is, lined up like the clues in a detective story. You can write your own scenario. It's easy to see, looked at this way, that an accident isn't an event —it's a process. Through the clues dropped along the way, the process is easily traced, from the designer who engineered a Murphy, to the technicians who, on two occasions, didn't bother using tech data, to the pilot who made a hasty preflight inspection—all of which led to a situation which was analyzed as dire enough that an immediate landing was necessary. The method of doing this was with higher than normal approach airspeed . . . the man on wing trusted lead and stayed with him . . . and had to lay on the binders because of a hot touchdown! This accident could have been nipped in the bud anywhere along the line, but the little things snowballed and got us again!

nowhere to go

Picture yourself in a T-37 trainer. Now picture a military weather advisory, covering your route of flight, which reads: ". . . tornadoes and locally damaging windstorm . . . severe thunderstorms . . . two percent max instantaneous coverage . . . 40 percent total area affected . . . three-fourths inch hail and SW gusts to 60 knots . . . max tops 520."

Sound like a good day for diverting early and avoiding the rush? Or even staying home by the fire and studying the Dash One? Somebody didn't think so.

The flight was a two-ship—qualified IPs flying both aircraft. The flight continued to get radar vectors to circumnagivate the weather until they were approximately 50 miles south of course, at which time Center advised that, due to opposing traffic, the flight would have to return to course. The flight split up and took separate vectors through the areas of least intensity. Fiberglass surfaces on both aircraft were damaged by heavy rain.

There's a good argument that they shouldn't even have tried the flight in the face of the weather advisory —but having tried it, the pilots passed up every chance to divert or go home until they were boxed in. By the time it became sufficiently obvious that they were headed for trouble, there was nowhere else to go.

COMMANDERS: *Anyone care to join me in wondering who approved this X-C request?*

Tech topics

BEARING BOO-BOO

Until touchdown all had appeared normal with the A-37. But as the weight settled on the main gear the aircraft began to pull to the left (the pilot said it appeared that the left brake was dragging). As the bird slowed it was obvious that the left tire was flat. Directional control was maintained with nose wheel steering and the aircraft stopped on the runway.

Once the bird was released to maintenance, it didn't take long to discover a major goof. The wheel assembly was inspected and found to have two outboard bearings installed. Inside diameter of the outboard bearing is 2.000 inches compared to 1.8125 inside diameter for the inner bearing. The incorrect bearing allowed the wheel to wobble; wobbling caused the tire to rub the brake; friction generated excessive heat and blew the thermal fuse plug.

This wheel assembly had been changed at a transient base. Regardless of where the maintenance was accomplished, attention to detail and the use of tech data by the man performing the work should have been SOP. But, as is often the case, it wasn't—and the inspector failed to detect the original mistake.

COMMANDERS: *Failure to follow tech data and indifferent inspection caused or contributed to many accidents and incidents in 1971. Are your QC troops looking for these deficiencies? Is your corrective action positive and permanent?*

FLIRTING WITH DISASTER

Call it a near miss, a flirt with death. Call it what you wish, but the grim fact is that any time an individual comes so close to an operating jet engine that his hat or ear protectors are ingested he is flirting with disaster.

In this case the crew chief had gone under an F-101 to check for hydraulic leaks. As he departed from the underside near the left intake, his parka hood was pulled toward the intake. He pulled free but his ear protectors were drawn into the engine. If an experienced crew chief can come that close to being ingested, what are the odds against less-experienced people—the mechanics fresh out of tech school? What is being done in your unit to prevent such accidents? Are maintenance supervisors emphasizing the hazards of working in the vicinity of operating jet engines, especially to the new, inexperienced young fellows?

• Briefs For Maintenance Techs

THINGS ARE MORE LIKE THEY ARE NOW THAN THEY HAVE EVER BEEN BEFORE!!

That makes about as much sense as driving your car without your driver's license, OR flying without the 781 Forms and not knowing where they are. This doesn't happen often but when it does it can be very embarrassing. In most cases the guys are unaware of the 781's whereabouts. It has always seemed to be in the cockpit somewhere when it was needed. But not every time! That plastic binder seems to fit in so many places; on the glareshield, in the map case, on or behind the ladder, in the truck, on the wing, or stuck on the nose gear somewhere. It's such a familiar part of the aircraft that it goes unnoticed quite easily.

A few times this year, this form has been found on the runway or blowing down the ramp after having fallen from the aircraft. In a couple of cases, that missing 781 has left telltale marks as to where it had been, such as slight damage to the nose wheel well area. It doesn't want to fit there very well with the gear up.

We all need to be aware of this one-in-an-umpteen times occurrence. Who's fault is it when this happens? The last guy who used them—or the one that is to use them next? (All of the above is the answer.) This aircraft "checkbook" has aroused enough attention to warrant reemphasizing its whereabouts in forthcoming changes to checklists and flight manuals. But it's still up to all of us, specialists, crew chiefs, pilots, refuelers, etc., to keep tabs on this evasive book.

Every cockpit has a place for the Form 781. Let's all team together and "trap" it in its proper place before starting the engines.

(ATC Safety Kit)

ENGINE INDIGESTION

Foreign object damage continues to be "jet engine enemy number one."

Much of the cause is just plain old carelessness. Here's one example.

An F-102 was on alert to support a division ORI. On preflight a flashlight was placed in the right intake during nadar installation and forgotten. During scramble it was ingested.

Another incident involved an F-104 during runway check. The crew chief had removed the tank pins and was directing the aircraft forward to complete the tire inspection when one of the tank pins got lost and was gobbled up by the engine.

Supervisors must demand good work methods, effective procedures, and equipment safeguards throughout the maintenance area. Experience has shown that a well organized and supervised FOD campaign will produce worthwhile results.

QC & AIRCRAFT HARDWARE

Quality Control inspectors: How many times have you found the wrong type hardware installed on aircraft during operational ready or in-process inspections?

During a recent investigation of a C-123K incident, all the flap bracket mount bolts were found with aluminum nuts installed instead of the required steel nuts. The inboard bracket mount bolts on the right outboard flap had pulled out of the aluminum nuts in flight. Can you imagine the controllability problems had the entire assembly separated from the aircraft?

The Dash 4 on each aircraft specifically lists all replacement items, by part number, and this includes nuts and bolts. QC inspectors, when you inspect the aircraft to determine that all hardware is installed do you look a little further to determine that it is of the correct type?

STIFF LEGS

Prior to flight both main landing gear had been inspected IAW TCTO 1T-39A-837 and the struts supposedly serviced per 1T-39A-2-1. The mission was uneventful until final landing, during which the IP was demonstrating use of emergency brakes. Touchdown was to the left side of the runway followed by a veer to the left. The IP immediately selected normal brakes and attempted a correction with nose wheel steering, to no avail. The aircraft was on and off and back on the runway before the IP finally brought the bird to a safe stop.

Failure to properly use available tech data caused this fiasco. Both main struts had been overserviced. This prevented strut compression, which in turn rendered nose wheel steering inoperative due to the open squat switch. Don't just have the TO available, USE IT!

Tech topics

THROUGH THE ROOF

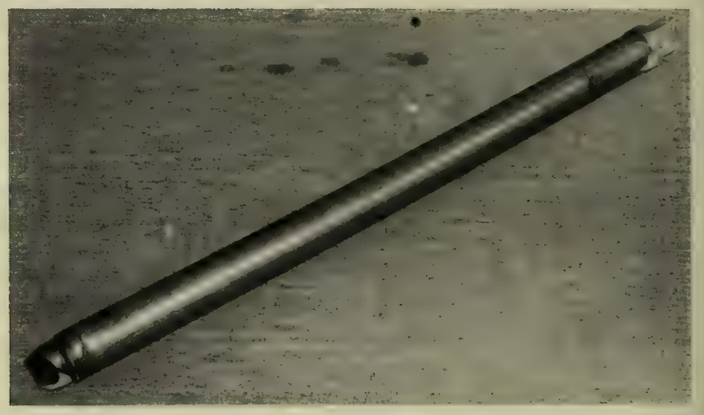
An egress technician with 12 years experience in the business was performing the flow check on the egress system lines of a T-Bird. TO 1T-33A-2 was on hand, and supposedly being used as the supporting tech data. As the technician applied compressed nitrogen, the rear seat catapult fired, exited the hangar through the roof above the aircraft and came to rest on the ramp 60 feet outside the hangar. Fortunately no one was injured.

With a man as experienced as this, and the TO on hand, how could such a thing happen? The answer is simple and all too familiar: **failure to adhere to the tech data.** The technician did not disconnect the seat catapult hose as called for by item 6, Figure 4-20M, page 456W of the TO.

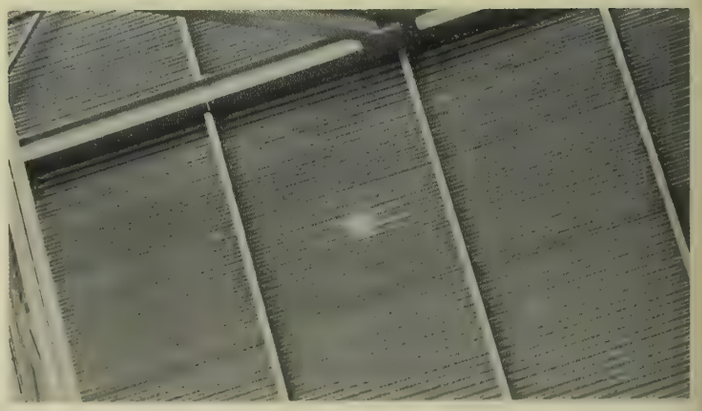
Photos at right show the sequence of events and illustrate the potential hazard of such flying projectiles.



This is the bird



that fired the rocket catapult



that went through the roof



and landed on the ramp in front of the house that Jack built.

TAIL-HEAVY TANKER

"Personnel have been realigned to insure that highly qualified people are available for adequate supervision during all work shifts." "Quality control is re-evaluating all crew chiefs that have been upgraded in the past 60 days on items such as refuel and defuel." "Seven level crew chiefs have been assigned as a training team to increase OJT effectiveness."

Why so many changes in a unit over night? Because a maintenance team which failed to use available tech data set a KC-135 on its tail during defueling. The aircraft was in maintenance when it was determined that it would have to be defueled to complete the work. Due to mission requirements, rapid defueling was selected as the most practical means. The tail stand was removed, number one engine started and the defuel process begun. However, the supervisor had not conducted a briefing before the operation was started, so no one knew who was in charge. Furthermore, the checklist available in the aircraft was not used. During all the rush and confusion, the defueling team failed to maintain proper CG and the mishap became inevitable.

COMPOUND ERROR

The RC-130 was climbing out after a touch-and-go landing when Nr 2 engine went to max power. Throttle movement had no effect so the engine was shut down and the crew immediately returned to base.

It didn't take long to find that the bolt, nut and cotter key that attached the coordination lever to the fuel control were missing. The fuel control had been changed during maintenance prior to this flight. Apparently a mechanic failed to install a cotter pin and an inspector compounded the error by not doing his job.

Granted, the man who did the work failed to do it correctly. But we're inclined to lean on the inspector just as hard as on the original sinner. The inspector, whether he's a QC type or the immediate supervisor of the man doing the work, is the safety link between maintenance and the people who fly in the machine. His is a very responsible job and it takes a responsible man to fill it.

COMMANDERS: *Is your tech data explicit? Do your people use it? Do your supervisors inspect before sign-off? Are your QC people checking for these answers? And what is YOUR action if reports are negative?*

DISCONNECT DISCONNECTED

During climb to altitude for spin entry, the T-37 IP noticed the left oil pressure indicator reading zero. Some engine vibration was noticed at this time and the engine was shut down and an uneventful single engine landing made at an auxiliary field.

Maintenance bought this one. The oil pressure indicating line quick disconnect was found disconnected, which had depleted the oil supply. Further inspection of the Q. D. showed it to be excessively worn. In fact, it was worn so badly that when it was connected and the lock ring rotated into place, a little jiggle would separate it.

When this engine had been pulled for a test cell run and reinstalled 90 days previously, maintenance personnel failed to comply with 1T-37B-6 WC-5, Card No. 006, item 6, which calls for the Q. D. to be checked for wear. Maintenance also goofed two days prior to this incident in that while troubleshooting an oil pressure fluctuation, they connected a direct reading gage to this fitting and failed to detect the worn condition.

TIRE PRESSURE

Three low approaches had been flown and as the F-111 was rolling on a touch and go landing a vibration was felt by both pilots for approximately three to four seconds; the AC also sensed a slight pull to the right.

After coordinating the problems with the command post, a successful approach-end barrier engagement was accomplished.

Extensive troubleshooting failed to uncover any cause for the vibration, except that a difference of 50 PSI was found in the nosewheel tires. Normal nosewheel tire pressure for gross weight is 215-235 PSI. The left tire had 210 PSI, the right tire 260 PSI.

This incident can be attributed to only one thing. Carelessness—on the part of the individual who performed the preflight, and on the part of his supervisor who didn't demand better. ★

shock. At 25 MA he will be "frozen" to the point of contact.

20 to 50 MILLIAMPERES—severe muscle contractions include those muscles controlling breathing. In addition to difficulty in breathing, the victim may be "knocked out."

50 to 75 MILLIAMPERES—almost certain unconsciousness.

75 to 100 MILLIAMPERES—as current nears 100 MA, the man is almost certain to die. Ventricular fibrillation sets in, the heart no longer circulates blood in the body, and even after the current is cut off, no pulse can be detected. Artificial respiration should be attempted, but unless a trained physician or a doctor can restore the natural rhythmic action of the heart by massage or controlled electrical shock treatment using special equipment usually found only in hospitals, it's almost impossible to save the victim's life. Usually the maximum time limit for resumption of natural heart function under these circumstances is about six minutes.

(Closed heart massage is taught in many first aid courses. This technique applied by a person trained in its use may save a life if used prior to the arrival of Medical personnel.—ED.)

0.20 to 2 AMPERES—this intensity of flow will paralize the nerves near the diaphragm or the nerve centers at the base of the brain. Breathing will be cut off.

2 AMPERES and over—the man will suffer severe burns due to "frying" of the body fluids and to external arcing at the point of contact. In addition, internal burns of the slow healing type will also occur. This latter fact might seem academic under the circumstances, but a peculiar thing sometimes happens when flows of above 10 AMPS occur for very short periods. The severe muscle contractions the man experiences may prevent ventricular fibrillation, and after release, if proper first aid is administered soon enough, he might survive if the heart picks up its regular pumping rhythm again.

The tabulation above is a general guide only. Naturally there will be variations due to individual circumstances. The physical condition of the victim may be a factor. But the important thing to remember is that *fewer low voltage shock victims can be revived than those receiving 1000 volts or more.*

SUMMING UP

With the foregoing facts in mind, we can do a summing-up exercise in relatively few words. Although we must be aware of the many variables in cases of electrical shock and the hazards which cause them, we can make some general statements which apply to almost all circumstances.

- If your body becomes part of a circuit, either as the load or as the conductor and the load, you will get an electrical shock.
- Your body will become part of the circuit if you come in contact with both a source of potential and a ground while your total resistance is low enough to allow a flow of current.
- Current flow is what kills or injures you—voltage only pushes the current through your body resistance.
- Direct current (DC) is generally considered to carry less shock hazard than alternating current (AC) for a given voltage, but it is likely to burn more severely since the arcs from DC are more persistent than those of AC.
- Body resistance is highly variable, principally because of changes in skin resistance from one body area to another due to thickness and amount of moisture on the surface.
- Electrical energy sources (AC or DC) operating with an open circuit potential of 30 volts or more with a capability of delivering 2.5 milliamperes or more into a short circuit are hazardous to you.

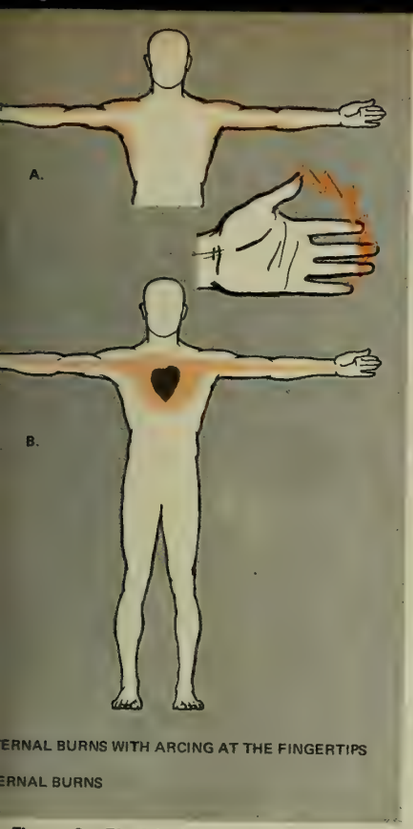


Figure 3 Electrical burns from over 2 ampere current

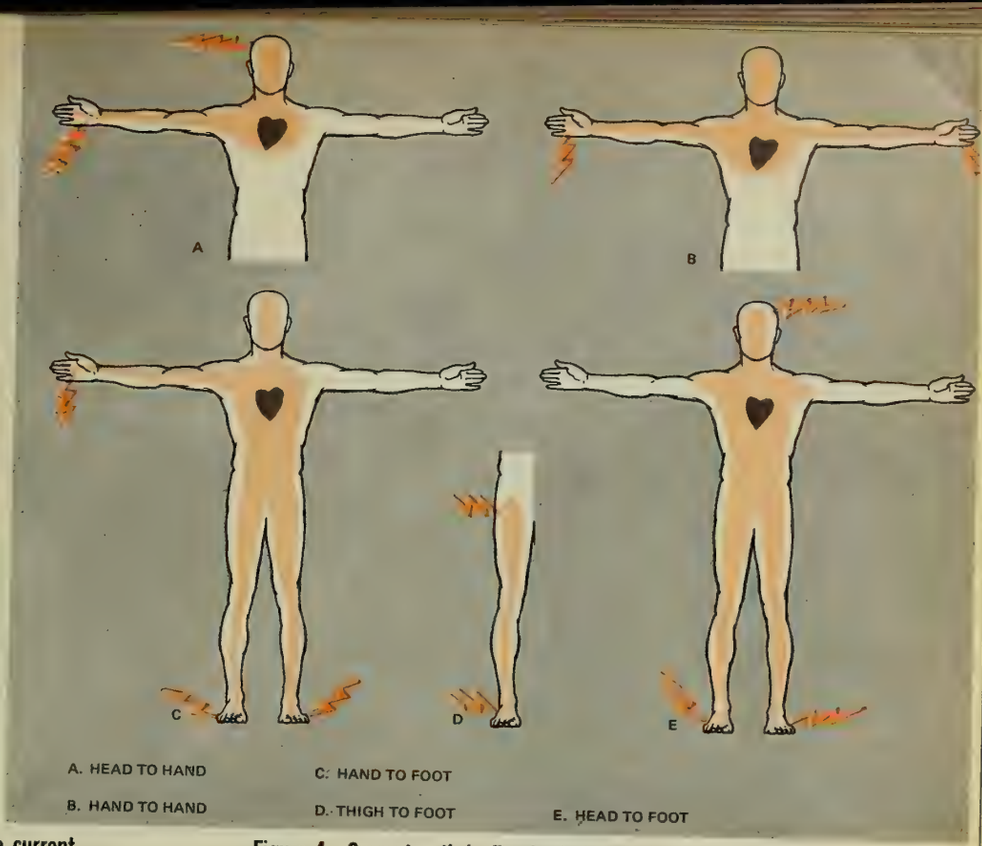


Figure 4 Current path in five basic types of shock

• Low voltage (less than 600 volts) can be more dangerous to you than high voltage. Accurate statistics show that 62 per cent of victims recovered after being knocked out by potentials over 1000 volts; for lower voltages, only 39 percent recovered.

• The seriousness of electrical shock depends on the balance between several factors—the voltage, the body resistance, the amount of current flow and its path through the body, the duration of contact and the condition of the body organs in the current path.

• The most hazardous currents are those in the frequency range from 20 to 100 cycles per second (cps). Currents of higher frequencies are less hazardous because they tend to flow on the surface of conductors rather than through the conductors themselves. High frequency current will cause electrical shock but to a lesser extent for a specific current value.

• The current required to operate just one 100-watt light bulb is **eight to ten times the amount that is needed to kill you.**

SAFETY PRECAUTIONS

There are a number of safety precautions you can take to minimize the degree of exposure and the potential for being on the receiving end of an electrical shock. Some of these precautions involve the equipment you work with—others have to do with your attitude toward your work and your interest in safe working conditions. Let's tick off some of the most time-tested precautions in both areas, as they apply to the mechanic or technician working either on the airplane or at the bench in the hangar or shops.

SAFE PRACTICES Start with *good housekeeping* in your work area. Keep it clear of clutter, stray wires, solder drops, unusable spare parts and unoccupied people.

1. *Don't work on energized circuits.* If you can possibly avoid it, don't touch a live circuit *anywhere.* Of course, some of us must work on energized circuits to do our jobs, but in such cases we should be properly trained and always know for sure what voltages and frequencies we are involved with.

2. *Avoid working alone.* When using electrical equipment, if you can work with or around someone else, you are safer, especially if he knows how to turn off the power, how to get help in an emergency, and how to apply artificial respiration.

3. *Follow the Technical Manual.* Safe procedures for all the technical operations are contained in your approved technical publications. Follow them, and if

there is a checklist for your particular operation, USE IT. Don't depend on your memory, and don't try to take short cuts.

4. *Rig power cables properly.* Never use portable cords or other equipment in such a way that a *male plug* can be energized except when it is in a receptacle. When connecting a motor or other equipment to a power source, first make sure that the switch or circuit breaker is open at the source. Then connect the cord or cable to the equipment you are going to use, and work back toward the power source with dead cable in your hands, making the connection to the source your next-to-last move. Your last move, then should be to turn on the switch or close the circuit breaker while watching to see if there is any evidence of overheating or arcing in the supply cable or the equipment itself. NEVER CONNECT TO A POWER SOURCE FIRST. NEVER MAKE INTERMEDIATE CONNECTIONS UNLESS THE POWER IS OFF.

5. *Keep yourself and your equipment dry.* Moisture is your enemy when you work with electricity.

6. *Make sure that grounding is proper and complete.* Most electrical industrial equipment comes with carefully designed grounding provisions. Most cords use three or four-wire cable to ensure your safety by providing a built-in low-resistance path to ground in case of a short circuit. *Don't guess about this.* If there is any doubt in your mind about the condition or function of any electrical equipment you may have to use, get help from authorized and trained personnel instead of taking a chance.

Grounding is one of the ways we prevent injury from electricity (the other is insulation). Adequate grounding of all non-current-carrying parts of electrical equipment which could become accidentally energized will help to keep you from "frying" when using such simple tools as a drill motor, or such complex ones as an electronic bench test set.

7. *Be familiar with first aid procedures.* If your buddy is not so careful as you, your knowledge may save his life.

8. *Use the right tool for the job.* Don't overload or abuse electrical equipment or circuits beyond their capacity. Don't try to "fool" the circuit by using a fuse heavier than the one authorized, or by "bridging" a burned out fuse with heavier conducting material. Don't replace fuses by hand on live circuits; use a fuse puller.

9. *Use safety lights in closed or fume-laden areas.* Whenever you work in a closed area or in a place where volatile fumes could collect, use only approved, sealed safety lights and explosion-proof equipment. Some explosions in the past haven't killed anyone, but those present were electrocuted by the bare wires whipping around as a result of the big boom.

10. *If someone else becomes a shock victim, don't join him.* Don't become part of the circuit yourself. Turn off the power or manipulate the wires or the victim with something you're SURE is a non-conductor (some rubber items are pretty good conductors). As soon as you can touch him safely, apply artificial respiration. Speed is essential—in 600 cases studied, 70 percent recovered when artificial respiration was applied *within three minutes.* Another minute of delay reduced the figure to 58 percent. Five minutes is too long—the chances are slim.

WORKING WITH 400 CYCLE AC

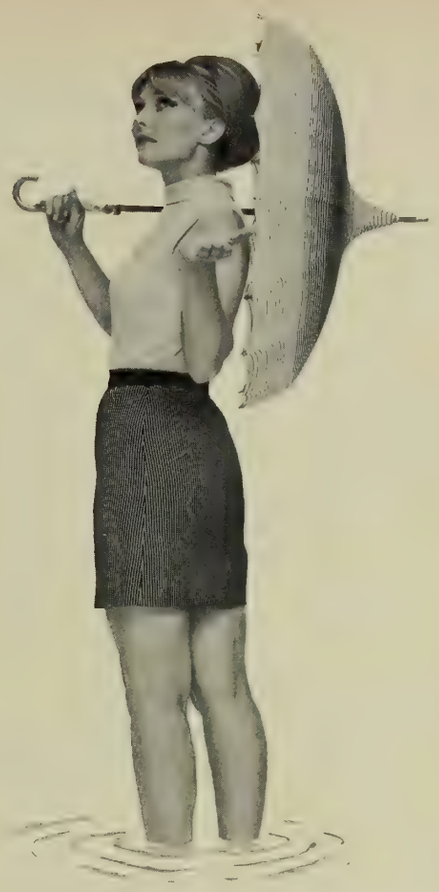
400 cycle AC electricity HURTS! Ask the mechanic who has been careless, he'll tell you for certain. For removal and installation purposes on the aircraft there is no problem (unless you forget to pull the proper circuit breakers). However, overhauling components on the bench is quite a different matter. Usually it is necessary in the case of actuators, valves, relays, and so forth, to apply power to the component for adjustment/test purposes. *In days gone by, when almost all components were powered by 28 volts DC, working with power applied presented very little danger. However, with the introduction of jet aircraft and the switch to 115-volts, 400 cycle AC, it's a different story. A mistake now presents a danger that could possibly be fatal.*

Extreme care must be exercised during bench adjustments. Turn the switch on your power supply OFF if at all possible while making any adjustment. Be certain that no part of your body is in contact with a possible ground return.

One further word concerning the bench power supply: There are two types in common use at the present time. The latest model employs an "above-ground" transformer and protects the operator from possible feedback through a metal bench or a damp floor. The older model does not afford this protection. It is possible to have full voltage standing between either test lead and any surrounding metal objects. Remember: If you must move a power supply, check it with a voltmeter *after* inserting the wall plug. This will eliminate that moment of surprise (115/220 volts AC, 400 cycle lightning bolt!) ★

Toots

is interested in your problems. She spends her time researching questions about Tech Orders and directives. Write her c/o Editor, Aerospace Safety Magazine, AFISC, Norton AFB, CA. 92409.



Dear TOOTS

My question is this, do we have to make out a new Form 365F for each flight? (C-119G, Class 2 Aircraft). TO 1-1B-50, page 4-3, para 4-17A, Change 6, states: "The pilot will cite previously filed Form F in base ops on DD 175."

TO 1-1B-40, page 3-5, section 3, para 3-20, Change 5, states: "It is necessary to accomplish Form F prior to a flight whenever an aircraft is loaded in a manner for which no previous valid Form F is available."

We do have representative forms on file in base ops.

MSgt John Jesse
T. F. Green Airport
Warwick, Rhode Island

Dear John

You answered your own question when you quoted TO-1-1B-40. You must complete the Form F only when no previous valid form for that individual load is on file at base ops.

Form Fs covering day-to-day operations such as training flights, predetermined loads, etc., should be filed and current in base ops; a new Form F is not required before each flight.

I talked with the technical order systems branch at Tinker AFB and they concurred. They also said that TO 1-1B-40 and TO 1-1B-50 are currently being revised. The revision should be in the field soon and hopefully the Form F area will be clarified.

Toots

Dear TOOTS

A question has developed in our Quality Control and Evaluation Section as to the interpretation of TO 00-25-172 and AFM 127-101 in the area of bonding maintenance stands in a refueling area. We are at odds in interpreting what is meant by the word "used". TO 00-25-172, page 4-BA, sub paras h and d state that if work stands are used they will be bonded to the aircraft. AFM 127-101, page 8-28, para 1(8) states that all equipment used in a refueling operation will be bonded and grounded.

During the refueling (over the wing) of our WB-57C aircraft, a B-4 maintenance stand is used to gain access to the top of the wings. Us good guys contend that the stand should be bonded to the aircraft during the refuel operation. The bad guys contend that the stand should be bonded to the aircraft only if servicing personnel are standing on it while refueling the aircraft.

Since we are at odds (split fifty-fifty) we have decided to ask you for your interpretation, so we may settle the question in this area for all concerned.

MSgt David L. Kutulis
58th WRS
Kirtland AFB, New Mexico

Dear Dave

My interpretation and that of the OPRs for both TO 00-25-172 and AFM 127-101 is that the B-4 maintenance stand will be bonded to the aircraft during all service and maintenance, even though it is used only to gain access to the wing.

Thanks for writing. I hope I haven't made any enemies with my answer!

Toots

EXPLOSIVES

IDIOT'S DELIGHT

foolishness with firearms is deadly

For a few moments following the sudden ear-ringing blast of a pistol shot, the barracks was locked in silence. Then someone telephoned for an ambulance, hallways began to fill with everyone moving toward the source of the sound. As a circle of staring faces formed around the tragic tableau in the dayroom a hoarse cry of "He's dead" again stunned everyone into silence. Suddenly, an ashen-faced young man cried out, "I didn't know it was loaded. I didn't mean to kill him." Then, collapsing into a lounge chair, he began to sob.

Corny fiction out of an old pulp magazine? Not at all. Air Force personnel have played principal and supporting roles in variations of this tragic scene time and time again. Fortunately, most of the victims recovered, but not without pain, hospitalization, and a scar as a reminder of the potentially fatal incident.

LT COL EARLE P. BROWN, Directorate of Aerospace Safety

SAFETY

for munitions, weapons, and egress techs

However, the story never ends at this point. Usually much more is in store for everyone involved. There is the inevitable emotional trauma, subsequent disciplinary or administrative action, and possibly irreparable damage to a future military or civilian career. These are bitter prices to pay for a momentary whim, a bit of foolish horseplay, or deliberate disregard of regulations controlling the possession, handling, and use of firearms.

Air Force experience over the past six years reveals a discouraging number of deaths, injuries, and tragic losses due to firearm incidents. Since 1966 almost 700 have been recorded with 42 ending in the finality of death and more than 640 resulting in gunshot injuries. Costs have totaled $3,338,009—over one-half million dollars annually—and this does not include the loss of production while the injured parties were recuperating from their wounds.

Ironically, a factor found in a majority of cases was the recurring problem of the immature individual who failed to project himself beyond the toy gun stages of childhood. The fact that this individual possesses a real gun does not deter him from continuing such juvenile games as "quick draw" or "stick-em-up" to impress or frighten or intimidate others. Just as mindless is the stupid bravado of Russian Roulette, an often fatal game played by idiots, with idiots, and sometimes watched by idiots who did little or nothing to stop the foolishness before someone was killed or injured. There are documented instances of Air Force personnel who have played and *lost* at Russian Roulette right before the eyes of individuals who could and should have prevented the ultimate tragedy.

Another disturbing element is the fact that most of the individuals involved were either weapon-qualified or assigned to duties regularly requiring them to be armed. Again, immaturity, evidenced by negligence, needless unholstering or toying with weapons, horseplay, or childish pranks, was found to be a significant factor in many of the tragic events.

Seventy percent of Air Force firearms incidents since 1966 were handgun mishaps; 35 percent involved .22 caliber pistols or revolvers. When rifle statistics are included the "deadly 22" accounted for a third of the gunshot deaths and almost one-half of all the injuries. These facts add further substantiation to the premise that most of the individuals involved failed to properly consider a firearm a potentially lethal instrument.

Twenty-nine percent of the injuries and one-half of the gunshot deaths were associated with shoulder weapons—rifles and shotguns of various gauges and calibers. Here, negligence and inexperience took their deadly toll with immature regard for the lethality of the weapon running a close third among predominate cause factors.

Contrary to the current movie or television symbol of masculinity, a gun does not make the possessor a man. The term "man" implies maturity and we can point out 684 examples during the last six years where the proper formula of gun, man, and maturity went awry.

The solution to this problem is obvious and it is expressed by the word "discipline"—that discipline imposed by higher authority and self-discipline. Both are required if we are to eliminate the senseless loss of life and property caused by the irresponsible handling of firearms. ★



MAIL CALL

"Ricochet," JANUARY AEROSPACE SAFETY

We here at Zaragoza read your article ("Ricochet," Jan 1972) with interest. We had a rash of ricochet incidents/accidents last year, but as the result of some major changes to the range and an increased emphasis on ricochet hazards we have not had one incident since last April. ("Knock on wood.")

When Bardenas Reales Range was reconfigured in the summer of 1970, a strafing range was set up with two acoustiscore targets. From a slow start we built up to over 100,000 rounds of 20mm being fired from F-4s in March 1971. At that time, we were using the standard 55-89 minimums of 5° - 15°, 1600 foot foul line and 50 feet above target. We had at least four ricochet incidents, including a scratched radome, a shattered windscreen (no injury), a ruined J-79 engine and a lodged round inside an intake (three months to repair).

After the last we moved our foul line to 2000 feet as an interim measure, but were searching for a permanent answer. We had several inherent problems. First, the soil at the range is pure clay. With the least bit of rain it would turn to the worst type of sticky mud. This not only precluded the use of the potato-digger but often made it impossible for the cleaning crews of the Spanish AF to walk around to hand pick the areas. As it began to dry it would form large clods which immensely cut the efficiency of the potato-digger. When completely dried out, it would soon churn to powder, offering virtually no resistance to the rounds which often seemed to pass right on through and back into the air at high angles (shown by the large number of undamaged slugs to the sides of the areas).

An answer from the Fighter Weapons Center to 16AF suggested the use of sand. We proposed using sand and the moving of the strafing complex 400 feet down range to give a permanent 2000 foot foul line. The use of sand was approved but we were instructed to stay at 1600 feet.

During the period 30 June to 19 July 1971 the range was closed for a complete renovation. We dug pits two feet deep, 80 feet wide (the width between our poles) and 300 feet long (100 feet short to 200 feet beyond the targets). Into these two pits we put 3100 metric tons of sand (3410 U.S. tons or 2000 cubic meters). It required 137 truckloads by five trucks hauling the washed sand 20 miles from the Ebro River over a two week period. The approximate cost was $8000.

Our original design for the sand was for it to allow the use of the digger in damp or wet weather. This it does, but we have discovered a much more important side effect. The sand, wet or dry, furnishes much more mass which nearly always causes the 20mm rounds to burst on impact. It is almost impossible to find undamaged or intact slugs. They also seem to usually ricochet out of the sand filled area at low angles to great distances down range. It is hard to find slugs at the sides or off the end of the sand, indicating that they don't go up into the air at high angles, coming back down nearby. The mass of the sand precludes deep entry so that at the end of a day's firing, most of the remaining rounds are on or near the surface making "hand picking" efficient and easy. The Spanish AF soldiers comb each side every night and usually find only several hundred slugs, when between 5000 and 10,000 rounds have been fired that day. We also use the potato-digger every Friday.

Along with the sand we have instituted a program including briefings for the TDY F-4 aircrews and strict enforcement of AFR 55-89. Our Range Control Officers (TDY from the 16AF and 17AF units using the range) are instructed to refrain from calling "pressing"; a pilot either fouls or he doesn't. He has the authority to also call a foul when he sees a "slow or lazy pulloff." It is our opinion that more ricochet incidents are caused by an easy recovery and flying through the most hazardous area than by firing past the line. At the direction of USAFE we have recently added an 1800 foot foul line as the minimum firing distance.

Whatever the reason, we feel we have now achieved some measure of success. We aren't going to break our arms patting ourselves on the back, however, as we could pick one up tomorrow. We plan to continue our present procedures, perhaps adding the use of a magnet if it proves successful.

While these discoveries may not be completely new, they were new to us and we aren't sure how many other ranges know this or perhaps have other ideas. Feel free to pass my name and address along to anyone desiring information from us or having information which may help us. We are proud of our recent record and of our range and hope to better it. Our address is: 406th Tactical Fighter Training Group (DOWL/Range Operations), APO New York 09286.

Maj Kenneth D. Deal
OIC Range Operations and
Weapons Liaison Officer

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UNITED STATES AIR FORCE

WELL DONE AWARD

Presented for outstanding airmanship and professional performance during a hazardous situation and for a significant contribution to the United States Air Force Accident Prevention Program.

LT COL JOSEPH C. BRYDE



184th Tactical Fighter Training Group, McConnell AFB, Kansas

Lieutenant Colonel Bryde was flying as number three n a low-level navigation mission in an F-105D. At 000 feet AGL and 400 knots, the airplane suddenly egan a rapid roll to the left. The autopilot and the ability augmentor were disconnected and right aileron ressure and right rudder applied with no effect. The ontrol stick would not move to the right and the air- lane continued to roll to a 100 degree left bank. ieutenant Colonel Bryde reduced power and applied eavy positive G load which caused the airplane to ll slowly back to the right. The airplane rolled to a) degree left bank but upon reapplication of power it gain began to roll to the left. Lieutenant Colonel ryde again reduced power and established a climb to duce airspeed below rudder lock-out speed, where he as able to maintain wings level flight with nearly full ght rudder. He climbed to an altitude above 18,000 et and declared an emergency.

Lieutenant Colonel Bryde discussed the situation th the flight leader and the mobile control officer d was advised by the flight leader that the right eron appeared to be full down. He then lowered the t flap to relieve the heavy right rudder pressure. The control stick still could not be moved to the right, but a 10-15° right bank could be established with rudder. He experimented with flap positions and minimum control speeds with the gear down to determine best landing configuration. With the left flap 48 percent down, and the right flap full up, the controllability check was satisfactory and the airplane was landed from a straight-in approach at 235 knots. Touchdown was 2000 feet down on a 12,000 foot dry runway. Aerodynamic braking, the drag chute, and normal braking slowed the aircraft to taxi speed. Inspection found the right aileron to be full down, left aileron neutral and both spoilers closed. Further inspection revealed a small wire bundle clamp support bracket in the right wing had broken from its mounting screw and lodged in the right aileron power control unit, locking the control valve in the extended position and routing hydraulic pressure to the down side of the right aileron actuator.

Lieutenant Colonel Bryde's rapid response in countering the sudden uncontrolled roll at low altitude and his skill in landing without full use of the flight controls prevented the loss of a valuable airplane. WELL DONE! ★

THE AMBULANCE DOWN IN THE VALLEY



'Twas a dangerous cliff, as they freely confessed,
Though to walk near its crest was so pleasant;
But over its terrible edge there had slipped
A duke and full many a peasant.
The people said something would have to be done,
But their projects did not at all tally.
Some said, "Put a fence 'round the edge of the cliff,"
Some, "An ambulance down in the valley."

The lament of the crowd was profound and was loud
As their tears overflowed with their pity;
But the cry of the ambulance carried the day
As it spread through the neighboring city.
A collection was made, to accumulate aid,
And the dwellers in highway and alley
Gave dollars or cents—not to furnish a fence—
But an ambulance down in the valley.

"For the cliff is all right if you're careful," they said;
"And if folks ever slip and are dropping,
It isn't the slipping that hurts them so much
As the shock down below—when they're stopping."
So for years (we have heard), as these mishaps occurred
Quick forth would the rescuers sally,
To pick up the victims who fell from the cliff,
With the ambulance down in the valley.

Said one, to his pleas, "It's a marvel to me
That you'd give so much greater attention
To repairing results than to curing the cause;
You had much better aim at prevention.
For the mischief, of course, should be stopped at its source;
Come, neighbors and friends, let us rally.
It is far better sense to rely on a fence
Than an ambulance down in the valley."

"He is wrong in his head," the majority said,
He would end all our earnest endeavor.
He's a man who would shirk this responsible work,
But we will support it forever.
Aren't we picking up all, just as fast as they fall,
And giving them care liberally?
A superfluous fence is of no consequence,
If the ambulance works in the valley."

The story looks queer as we've written it here,
But things oft occur that are stranger.
More humane, we assert, than to succor the hurt
Is the plan of removing the danger.
The best possible course is to safeguard the source
By attending to things rationally.
Yes, build up the fence and let us dispense
With the ambulance down in the valley.

Author Unknown


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UNITED STATES AIR FORCE MAY 1972

Aerospace SAFETY

FOR AIRCREWS, MAINTENANCE & SUPPORT TECHNICIANS

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MAY 1972 AFRP 127-2 VOLUME 28 NUMBER 5



THE back side of the attitude curve

COL SCOTTY O. FERGUSON
Directorate of Aerospace Safety

It was gratifying to see our accident rate hit the lowest point in Air Force history, last year (2.5). But there are days when that rate doesn't mean much; not when there are four major accidents in one day —three of them bad ones, totaling two dead and two badly mangled pilots. It kind of gets you right in the squadron patch and makes you churn a little inside, too.

When you're in a unit for a good long time, and your outfit has been fortunate enough not to have had a bad bash, and the familiar faces are all still climbing in the cockpits, it may be difficult to get excited about another unit's misfortune. But when you sit here at the Safety Center and get the bad news in bunches, it takes a little out of you. After a couple of years, you feel a direct responsibility every time you read, "No apparent ejection attempt," or "Aircraft had double engine flameout immediately following takeoff—two fatalities." It gets to you because you suspect that perhaps you didn't look deep enough or communicate well enough to prevent whatever went wrong.

It shouldn't come as a shock to anyone that we're flying some airplanes that require pretty delicate maintenance and some pretty fancy stick and rudder work; and that means super maintenance, super inspections, super operations, and super supervision. It also means everybody in the business has to work together. Anything less, and the aircrews are starting their takeoff roll on the back side of the power curve.

When one considers that a fighter pilot is within a fraction of a second of buying the farm each time he completes a weapons delivery, and that all aircrews are almost as close on each takeoff and landing, it should come through to all of us that cool, calculated perfection in one's work prior to an aircraft takeoff is as important as the life or lives of the warm bodies in it.

When a guy gets nailed by a ground gunner or a MIG pilot, that's one thing and you can pretty much accept it. But to lose a young tiger, or an old head, because something broke or went ape or because he was put into an operational situation beyond the ability of a Lindberg to handle, then we've failed—badly. And it's the worst kind of failure, because it isn't one you can mend—it's final.

We all need to do a lot of soul-searching and ask ourselves, "Am I really doing the best I know how—no shortcuts, no hurry-up jobs—precision all the way?" If just one guy along the way to getting an airplane in the air isn't completely professional in accomplishing his required duties and tasks, you can bet that the end result will be another smoking hole and probably a requiem for another aviator who got short-changed.

It's all a matter of attitude. If you're going to do a job, do it the best you know how. If you don't think your knowledge is quite good enough for a particular task, be big enough to admit it and get help. Above all, don't just not give a damn! We're talking about people's lives! ★

egress systems update

ROBERT H. SHANNON
Directorate of Aerospace Safety



SECOND IN A SERIES ON UPDATE OF USAF AIRCRAFT EGRESS SYSTEMS

A-7D, RB-57F, B-57G

THE ESCAPAC escape systems manufactured by McDonnell Douglas have a long history of highly successful use by the U S Navy. We were introduced to the ESCAPAC 1C in the RB-57F aircraft. It was subsequently chosen for the entire B-57 fleet, primarily as a result of the emphasis placed by the USAF Task Group Review cited in the first article in this series.

Because of the system's relative newness to the Air Force, our operational experience is quite limited. There have been two ejections from the A-7D and two from the B-57G to date, all of which were successful. The Navy advises that they have had 206 ejections with a 90 percent success rate. They report that 71 of these were below 500 feet, with 59 (83 percent) of the 71 successful recoveries.

We are not often fortunate enough to acquire a system with such a successful history already documented. Certainly we can and have profited greatly by the Navy experience. As stated earlier, this is a new system as far as the Air Force is concerned, not just a modification of an existing in-service seat.

Basically, the ESCAPAC 1C is a small, extremely rugged, lightweight seat with a demonstrated recovery capability from a static condition (0-0) to 600 knots, the latter being an Air Force qualification test requirement to assure safe tail clearance at all operational speeds. It incorporates such features as the aforementioned ground level escape, tht DART (Directional Automatic Realignment of Trajectory) Stabilization System, controlled acceleration, dual single-motion ejection controls (face curtain and seat-mounted D-ring), inherent leg restraint (without physically attaching the pilot to the seat), increased comfort, integrated ground safety, and minimum maintenance.

Typical sequence of events is shown in Figure 1.

Let's take a look at these events. After initiation the catapult tubes separate at the top of the guided stroke and the rocket sustainer stage ignites, propelling the seat away from the aircraft. At 0.32 second the DART action starts, which stabilizes seat trajectory, compensates for adverse center of gravity variations, limits maximum rotational

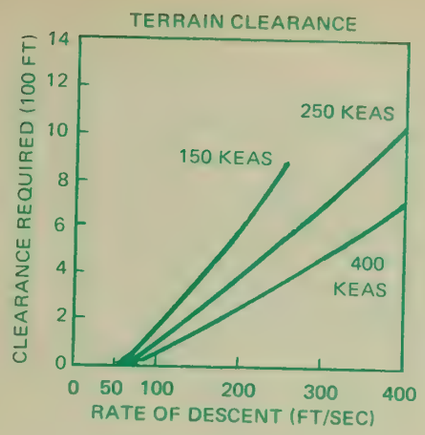
FIGURE 1

SECONDS	EVENTS
Time (T) = 0	Ejection initiation. Catapult stage ignites; Inertia reel locks. Parachute 2.0 second delay cartridge arms Harness release 1.0 second delay cartridge arms Emergency oxygen actuates
T = .15	Rocket motor ignites
T = .32	DART action starts
T = 1.0	Harness release operates Man-seat separation occurs
T = 2.0	Parachute pack opens (if below present altitude of 14,000 ft MSL ' 500 ft).

Parachute line stretch and inflation are dependent on airspeed at time of ejection. For example, at 200 to 250 knots, approximately 2 additional seconds are required for chute deployment. Total system operation time from initiation to a fully developed chute would be on the order of about 4 seconds under these conditions.

rates to acceptable values, and provides consistent and predictable seat trajectories. The legs are drawn back due to inertia and held against the seat by the dynamic forces. Lateral leg restraint is provided by the extended seat sides.

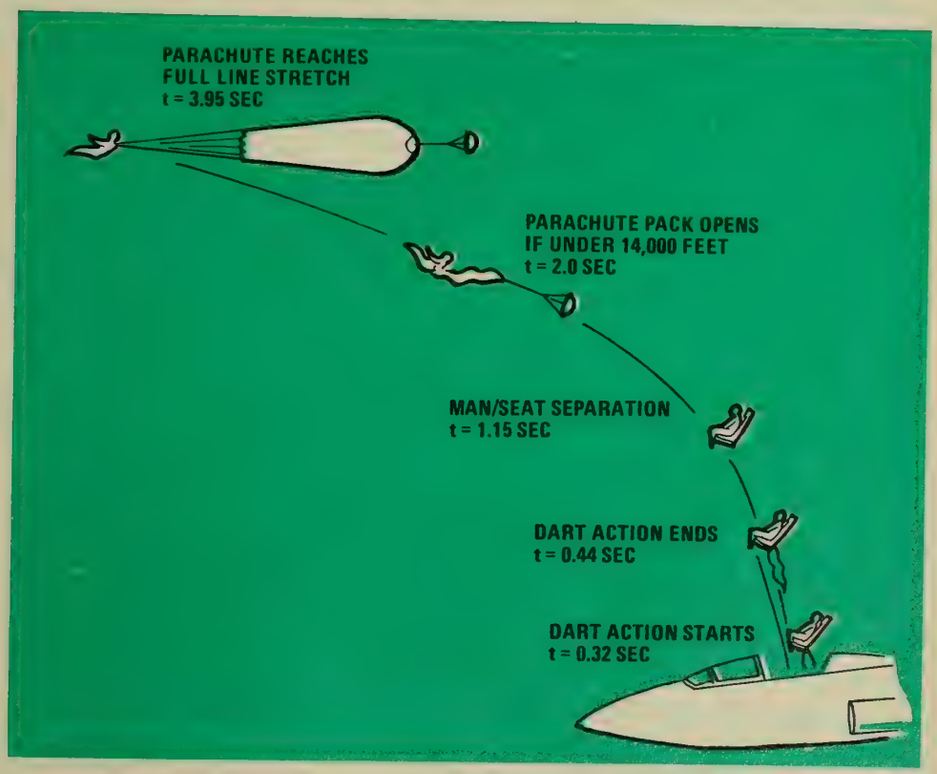
After a 1.0 second delay the harness release actuator separates the pilot's harness at three points and releases both ejection controls from the seat (eliminating the possibility of hanging onto the seat structures). Immediately following harness release, two bladders, one mounted on the seat pan and one on the inside seat back, are inflated with high-pressure nitrogen, forcefully and rapidly separating the pilot from the seat. After an additional 1.0 second delay and when below 14,000 ft MSL, the chute is deployed. From this point on, you are on your own. Your life support training will determine how you handle the parachute descent and parachute landing fall.



Various airspeed and sink rate conditions; pilot reaction time not included.

This then is essentially how the ESCAPAC 1C ejection system works. It's a good system with proven reliability, but do not stop here in your quest for information. Know your Dash One procedures, insist on frequent in-depth briefings from your life support people. Get all the life support training you can. Should you ever desire to know anything concerning this system that you cannot get an answer to, write a letter or call the AF OPR, which is the Life Support System Manager at Kelly AFB.

The ESCAPAC 1C can and will save your life should you find yourself faced with a situation requiring inflight escape; BUT YOU MUST GIVE IT A CHANCE TO DO THE JOB. The latest state-of-the-art features incorporated in this system were put there for one purpose and one purpose only—to give you a better hack at it in an emergency under marginal conditions. The added capability afforded by this or any other system must never be the basis for staying with the aircraft just a "little longer" in an attempt to salvage a futile situation. This attitude has resulted in the tragic and alarming loss of far too many Air Force crewmembers over the years. No system, regardless of its capability, can save your life if it is not used within its design capability. ★



ESCAPAC IC ESCAPE SEQUENCE (TYPICAL)

THE I.P.I.S. APPROACH

By the USAF Instrument Pilot Instructor School, (ATC) Randolph AFB, Texas

ARCS and RADIALS REVISITED

Anyone who flies with TACAN or VOR/DME should have in his bag of tricks at least one or two techniques of computing leadpoints to fly from radials to arcs and from arcs to radials. AFM 51-37, Chapter 12, offers a number of different methods, all of which offer reasonable accuracy and are not particularly difficult to use.

Here is a slightly different method that you may find useful, particularly if your maneuvering speed is more or less constant. This was offered to us by a C-123 type at HRT who swears by it. As he says, "Try it, you'll like it!"

1. Find your bird's turning radius from AFM 51-37, page 8-14. For example, maneuvering at 150 KTAS and 30 degrees of bank will produce a turn radius of 3500 feet (no wind). Converting this to miles $\frac{3500}{6000}$ gives a radius of approximately 0.6 NM. If you're always at 150 knots using 30 degrees of bank, lead all radial to arc intercepts by 0.6 NM.

2. Here's a handy-dandy formula for computing the arc to radial leadpoint:

$$\frac{\text{Turning Radius (ft)} \div 100}{\text{DME}} = \text{Leadpoint (degrees)}$$

Let's plug in some numbers and see what we get. Using the same radius of turn (3500 feet) and assuming the seven DME arc,

$$\frac{3500 \div 100}{7} = \frac{35}{7} = 5 \text{ degree leadpoint}$$

If you are on the 10 DME arc, the leadpoint becomes

$$\frac{35}{10} = 3.5 \text{ degrees}$$

For a given groundspeed and angle of bank, your radius of turn is always the same. All you need remember, then, is your radius of turn in miles and one percent of your radius of turn in feet (0.6 NM and 35 in our example). Lead an arc intercept by 0.6 NM and lead a radial intercept by $\frac{35}{\text{DME}}$.

Don't forget to compute the actual numbers for your particular aircraft.

The formulas and techniques discussed above and in AFM 51-37 can be used as an effective aid in developing a better awareness of your turning performance and greater precision in instrument flight. Use of groundspeed, where known, will compensate for the effects of wind.

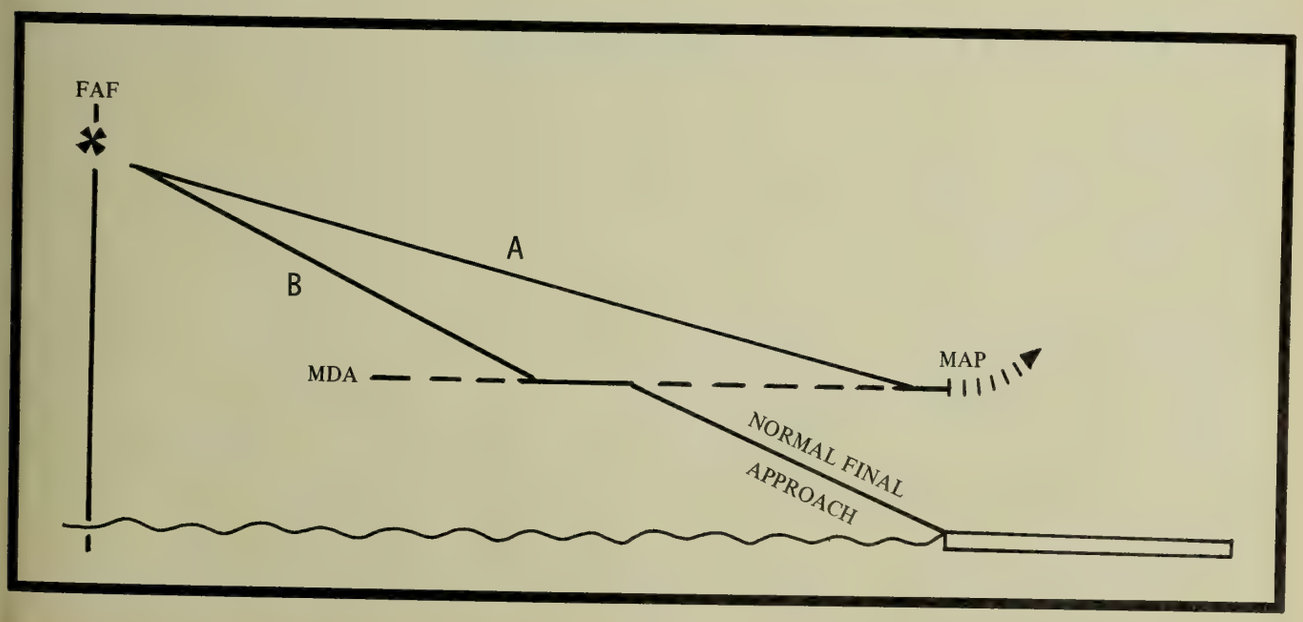
MISSED APPROACH POINTS

The USAF IPIS has received numerous inquiries concerning the missed approach point for non-precision approaches. Pilots are particularly concerned when they arrive at the MAP and find that they are not in a position from which they can make a normal landing. This is a fairly common occurrence as there is no requirement, nor is it possible, for the MAP to coincide with some point from which all aircraft can make a normal landing.

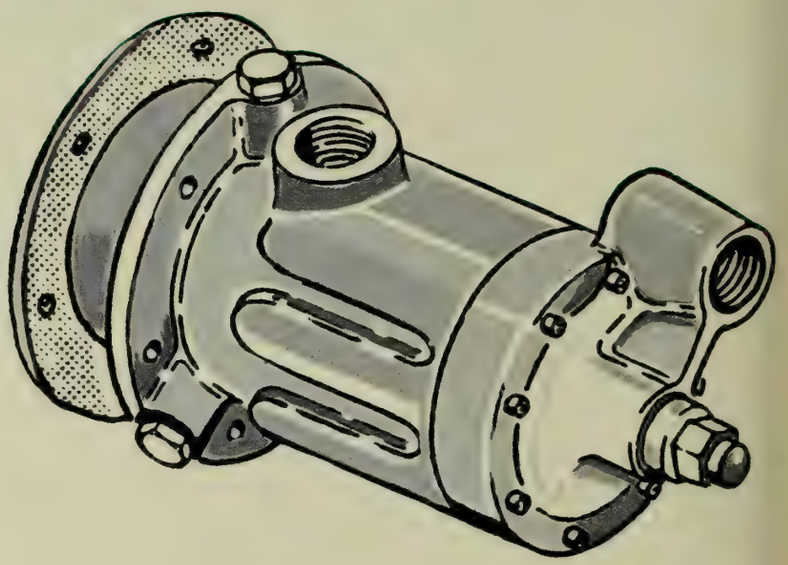
When an on-airport facility (VOR or NDB) does not provide a final approach fix, the facility itself serves as the MAP. For procedures which do provide a final approach fix, the MAP may be no further from the FAF than the runway threshold. In either case you may find yourself over or beyond the landing runway when the time comes to make the missed approach.

It is entirely possible that a descent made so as to arrive at the MDA and the MAP simultaneously would never intercept a normal final approach profile. (EXAMPLE A.) However, flight at MDA along the final approach will, for a straight-in approach, intercept or come very close to a normal final approach at some point. For this reason, AFM 51-37 requires that you "Descend to the MDA so that visual reference with the runway environment can be established as early as possible before reaching the missed approach point." This is shown in Example B.

The normal descent gradient for a final approach is 300 feet per mile with a maximum of 400 feet per mile. If you descend at a rate equivalent to a 300 to 400 feet per mile descent gradient (3 to 4 degrees descent angle), you will be assured of arriving at your MDA prior to both the runway and the MAP. The actual vertical velocity may be determined by reference to the Rate of Descent Table in the front of the approach procedure booklet. Another method is to multiply the descent gradient by your groundspeed in miles per minute. For example, 300 feet per mile times two miles per minute (120 knots) equals 600 feet per minute vertical velocity. Using this computed rate of descent, you should have sufficient time and distance remaining to identify the runway environment and maneuver to intercept a normal final approach profile. ★



HOT HYDRAULIC



This article is reprinted from Northrop Service News and is aimed primarily at F-5 troops; however, much of the info is applicable to other aircraft and is, therefore, recommended reading.

On 19 July 1971, TO 1F-5-706 was published directing that temperature-indicating tape be installed on the hydraulic reservoir sight gage glasses. This was done to give air and ground crews warning if the temperature of either or both hydraulic systems had exceeded the normal operating range on a previous flight or ground engine run. This was quickly followed by other technical order changes specifying when the temperature-indicating tape should be inspected, changing trouble-shooting procedures, and revising pilot operating instructions in case that a hydraulic system malfunction is detected in flight.

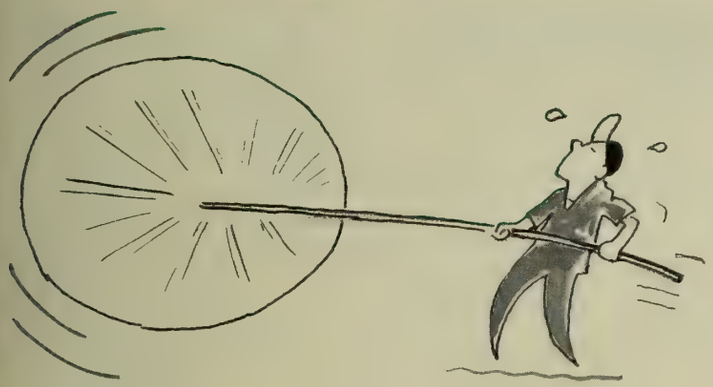
Many personnel in F-5 operating units have questioned the reasons for the changes since the hydraulic components of the flight control systems have been remarkably free of problems. As experience with the F-5 operation increases, it is natural that new techniques should be developed, which continue to improve the economy, simpilicity, and safety of the aircraft. The purpose of this article is to explain the reasons for the installation of the temperature-indicating tape and for other technical order changes and to advise you of an improvement being considered for installation in all F-5 series aircraft.

Some time ago, it was discovered during a test on the flight control test stand that some hydraulic tandem servovalves controlling flow from both flight control and utility hydraulic systems (horizontal stabilizer and aileron actuators) would require higher operating forces when the fluid temperature in the two hydraulic systems differed by an abnormal amount. It was further observed that servovalves with minimum clearances were more susceptible to this condition. Because of these discoveries, the minimum allowable internal clearance of the servovalves (as measured by lap leakage) was increased on all aircraft. This production change was effective on aircraft delivered approximately in April 1970 and on subsequent deliveries.

The high temperature in either hydraulic system can be caused by any of the following malfunctions:

- A pump malfunction may occur that causes the pump to put out excessively high pressure. The high pressure then opens one or more of the relief valves in the system. As the hydraulic fluid is forced through the relief valve(s), which acts (act) as a restricted orifice(s), the flow rate of the fluid is increased. The energy used in creating the high flow rate at high pressure is converted to heat. Because of the pump malfunction, the high-pressure hydraulic fluid keeps the relief valve(s) open, thus perpetuating this heating condition.
- A relief valve malfunctioning in such a way that fluid is bypassed at normal system pressure can cause heating for the above reason.
- A "blown" seal or other defect that bypasses fluid from system pressure to system return may create excessive heat. The size of the internal leak will affect the amount of heat. Maximum heating will occur when maximum energy is put into the system. This occurs when the internal leak bypasses a large amount of fluid under high pressure.

FLUID



It should be noted that hydraulic system pressure on the cockpit indicator may be normal or lower than normal with the second or third of the three malfunction conditions described above.

As a matter of interest, the oil cooler that was removed from production aircraft in 1965 did not have enough cooling capacity to prevent excessive hydraulic fluid temperature during any of the malfunctions described above.

About one year ago, two jet aircraft with flight control actuators identical to those installed in the F-5 encountered momentary servovalve binding. In both cases, the control problems resulted from excessively high fluid temperature at the flight control servovalves. The high temperatures were the result of one or more of the conditions described above.

A study program was initiated to determine cause of excessive servovalve forces and develop solutions for the problem. Based on Northrop tests, high servovalve forces induced as described above can have a critical effect on the controllability of the aircraft, depending upon how high valve forces become and upon whether or not the high forces are constant or intermittent. The valve forces result in high stick forces and control surface overshoot. The combination of high stick forces and surface overshoot will, in a severe case, result in pilot-induced oscillation (abnormal pitch or roll oscillation as the pilot attempts to control the aircraft), which could be critical in low level flight or landing pattern. Generally, high forces will occur throughout the total stroke of the valve, particularly at breakout from the neutral position. Cycling rate of the controls does not change the force level. The tests indicated that the critical temperature differential would be achieved about eight minutes after a malfunction was simulated on a test stand. The interim solution is publication of TO 1F-5-706, adding temperature-indicating tape to the sight gage of the hydraulic reservoirs. A black color on any of the temperature-indicating spots shows an unsatisfactory condition that must be investigated prior to further flight.

In answer to a number of questions from operating units, the indicating tape with four temperature-indicating dots was specified in case subsequent investigation disclosed that some temperature higher than 180°F would be acceptable. Investigation has confirmed that temperatures of 180°F or higher indicate an unsatisfactory condition in the hydraulic system and must be corrected prior to further flight.

In regard to troubleshooting high hydraulic fluid temperature, TO 1F-5A-2-2 states that any time a high temperature is detected, the affected hydraulic pump should be removed and tested in accordance with TO 9H4-2-41-83. This is important. However, if the pump is operating properly, relief valves and other hydraulic components in the affected system must be checked until the cause of the high temperature (bypassing) is identified and corrected.

For the pilot, an inflight indication of excessive hydraulic pressure could mean excessive temperature in a few minutes. TO 1F-5A-1 dated 1 January 1971, Change 2, 1 September 1971, directs immediate termination of the mission. Instructions for pilot action in case of flight control malfunction are also given and should be known by every F-5 pilot.

For the future, a system has been devised to give the pilot an indication in flight of high hydraulic system temperature by use of the existing caution system. Using the proposed system, the caution light that now indicates low hydraulic pressure would also come on if high temperature is detected. Reference to the hydraulic pressure indicator would then enable the pilot to evaluate the problem. In case of either low pressure or high temperature, the flight should be terminated.

Countries using the F-5, other than USA, currently are being asked if they desire installation of the high-temperature warning system.

In summary, a potential problem has been identified in the F-5 and corrective action taken. No actual occurrences have been reported in the F-5, but action has been taken to provide operating and maintenance instructions necessary to minimize the probability that any serious inflight malfunctions due to high hydraulic fluid temperatures will ever occur. ★

FEELING THAT SINKING

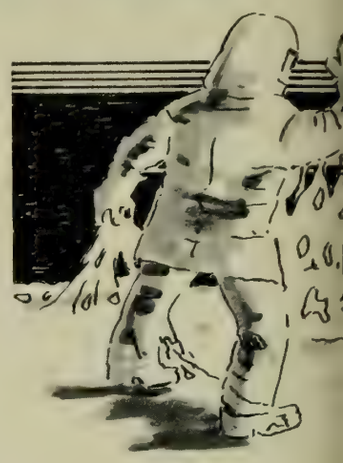
A two-engine aircraft was on a day VFR pilot upgrade training mission. After approximately two hours of flight, the IP in the left seat was making a landing to instruct the student pilot in copilot duties.

The copilot visually checked the gear and gave a gear down and locked signal by moving his left hand in a clockwise arc. In the process he hit the number two feathering button. The instructor pilot, noticing the power loss, advanced the throttles to maintain glide path and airspeed. The copilot, apparently not realizing what had happened, asked if a go-around was being attempted and, without a command from the IP, raised the gear.

Upon learning that the gear had been raised, the IP started a single engine go-around and instructed the flight engineer to bring the number *two* engine back in. The engineer, not wanting to be outdone by the copilot, pressed the number *one* engine feathering button. At this point, the IP called for gear down; the copilot—you guessed it—lowered the flap handle.

The IP, observing that the gear handle was not down, placed it down and made a smooth touchdown 4500 feet down the 9300 foot runway. The flight engineer moved the gear latch lever from the spring lock position to the positive lock position. The left main gear retracted and the aircraft came to a stop at the 6000 foot point on the runway. Fortunately, the three pilots and flight engineer were not "physically" injured.

You may think this is reminiscent of Ripley's believe it or not, but this fiasco actually happened.



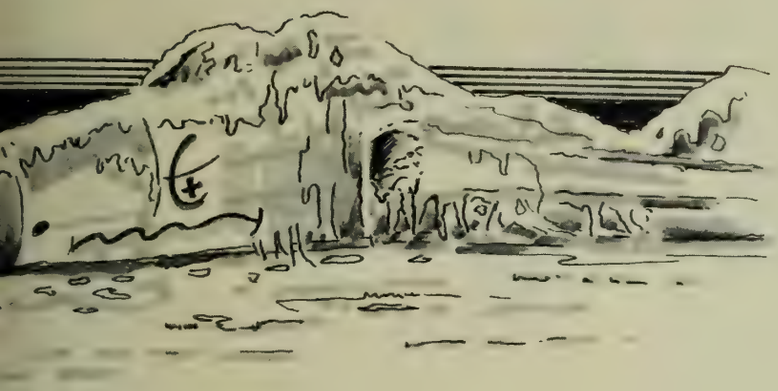
In another mishap the aircraft commander was assisted in a more passive manner. A two-seat fighter aircraft being returned to home base under night VFR conditions landed gear up, slid 5000 feet, and was destroyed. The landing light on this aircraft is located on the nose gear and cannot be seen with the gear up. This accident could have been prevented by (1) the pilot lowering the gear when the GCA final controller transmitted "wheels should be down," (2) the other crewmember informing the pilot of no gear, (3) the runway supervisory officer either notifying the pilot of the absence of a landing light or firing a flare and sending him around, (4) the tower operator transmitting landing light information to the pilot, or (5) a supervisor of flying in the tower ascertaining that the gear was down or sending the aircraft around.

Many other situations also resulted in landings without the benefit of undercarriage, e.g., initiation of a missed approach, to include gear retraction, and a subsequent decision to land; or delaying gear extension because of low fuel.

During the past ten years, 132 Air Force aircraft were unintentionally landed gear up, an average of over one per month. In the vast majority of the cases the pilot had plenty of help. Supervision was cited in 35



LT COL EARLE M. BOONE
Directorate of Aerospace Safety

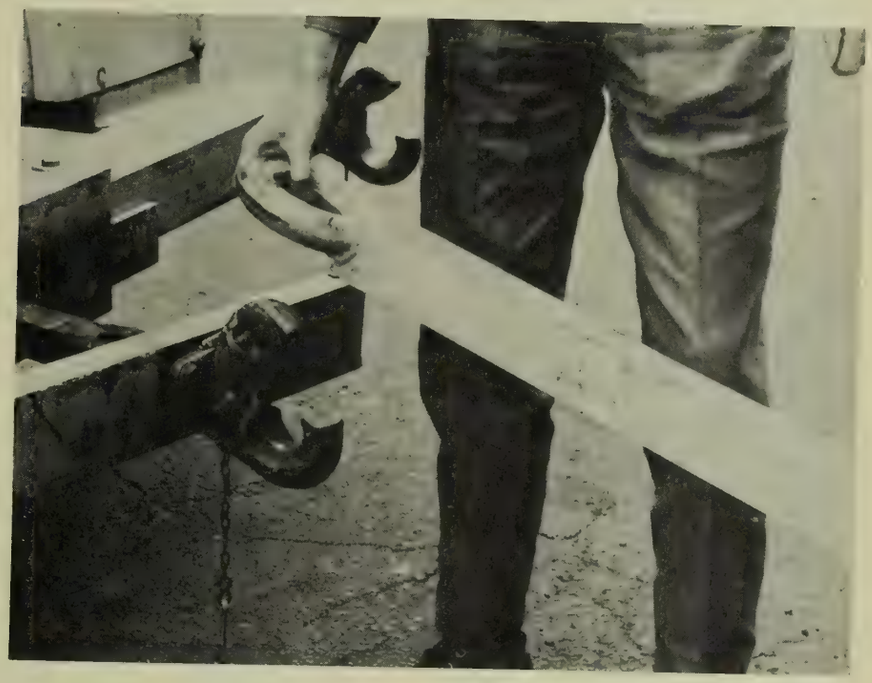


of the 132 occurrences, and in 90 instances other crewmembers assisted prior to the screeching sound.

Another common denominator was some distraction or deviation from the normal routine.

Based on these experiences, it is evident that we must (1) place more emphasis on supervision of the landing phase, and (2) make certain that all crewmembers are thoroughly briefed to be especially alert during any situation which deviates from the normal—so that they don't allow themselves to be lured into a gear-up landing. ★

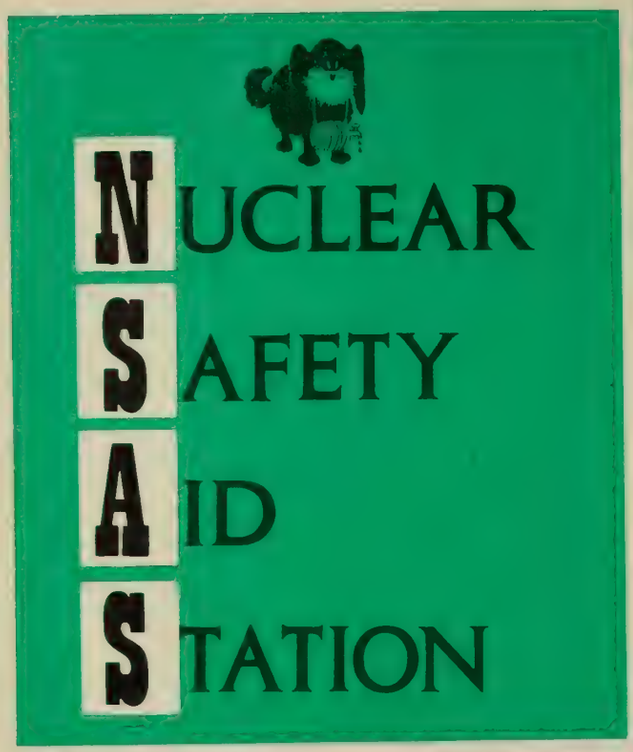
ONE MAN AGE



One of Aerospace Safety *magazine's pet projects is publicizing good ideas. WRAMA estimates that adoption of the mechanical hitch shown here will result in salary savings, in one major command alone, of more than $300,000 annually.* Aerospace Safety *would like to hear of other good ideas, with a safety motif, from its Air Force-wide readership.*

Positioning of ground equipment (AGE) is a difficult and hazardous task for one man, especially in ice and snow. Use of the mechanical hitch above, however, takes the work—and the hazard—out of the job. Mounted on an extending member, the hitch will extend 12 inches and swing 45 degrees to either side. The tractor operator merely backs to within 12 inches of the AGE tongue, dismounts, pulls the extendable hitch out and hitches up the AGE. He then remounts and backs up further until the extending member spring locks in place (and even if he forgets, the design strength of the extended hitch is greater than that of the AGE tongue).

Check TO 36-1-50 for info regarding the hitch and its acquisition. ★



NOT WHAT, BUT HOW?



At one of the missile launch control centers recently an indication lamp burned out in the signal data recorder drawer. When the technician attempted to replace the indication assembly, it arced and a Data Store and Processor lockup occurred. Although a tech order warning note stated that damage could occur when the assembly is replaced, it did not indicate how. (The locking pins come in contact with the metal frame, causing a short.) In this case, one individual found out how. To preclude others from making the same mistake, an AFTO 22 has been submitted to clarify how personnel injury or damage to equipment could result.

Perhaps you know of similar conditions that should be clarified. If so, submit an AFTO 22.



MAN THE PUMPS

One common problem that faces the Air Force every spring is the accumulation of ice and snow at Minuteman launch facilities, resulting in water accumulating in the bottom of the missile silo. Fortunately, weapon system designers have provided pumps to remove the water, but this doesn't remove the primary cause—launcher closure seals that do not prevent water from entering the launcher. Contributing causes of water accumulation are:

- Accumulation of ice and snow at missile launcher.
- Warm air and ground temperatures resulting in thawing.
- Heavy spring rains.
- Inadequate site drainage due to natural damming.

AFLC (OOAMA) has a modification requirement to improve the seal or possibly implement a new design seal. Until the problem is solved, the Air Force will have to cope with the spring weather conditions of 1972.

To preclude or reduce possible damage to Air Force resources, the following corrective actions should be continued or undertaken.

- *Continue or increase present aerial and ground inspections of sites before and during spring thaw.*
- *Review and evaluate for drainage conditions prior to and during periods of thawing.*
- *Implement snow removal plan when required.*

SAC Wing Commanders should:

- *Review the adequacy and effectiveness of the flood control plan.*
- *Ensure that all key personnel become thoroughly familiar with required tasks and responsibilities.*
- *Utilize the accident/incident/deficiency (AID) reporting system.* ★



REX RILEY'S CROSS COUNTRY NOTES

In spite of everyone's efforts, the major irritant to our transient troops remains the inability to obtain fuel in a relatively short period of time after landing. Nobody argues with the fact that VIPs should be refueled as rapidly as possible and that mission requirements take priority, but what is inexcusable is the fact that communication often breaks down between transient service and the refuelers. In one particular instance I was told we could expect fuel in ten minutes. This ten minutes lasted for two and a half hours. I was also told by one alert troop that it was the policy of the refueling section to wait until the aircraft had chocked before a fuel truck would be dispatched. There must be a reason for this, but I just can't think of a good one. In another case one transient troop thought the other had called refueling and vice versa. As a result nobody called.

ATIS INFO. In case you have a VHF radio or VOR aboard your aircraft, I strongly advise you to use it to contact the ATIS when arriving in high density areas. From this recorded broadcast you can get a neat bunch of information. For one thing it's a quick way to get a current weather status. If everyone would do this it would significantly reduce the amount of chatter in critical areas. Then when you get your controller, tell him (phonetically) INFORMATION RECEIVED. (Reference, FLIP Enroute)

PILOT TO DISPATCHER. Most of our bases have by now gone to the expense of installing a UHF radio in Base Ops and call it Pilot to Dispatcher. Normal freq is 372.2 mHz. However, we are finding that most pilots don't make maximum use of this facility. I recommend you call in as early as possible before landing and see if there might be some unexpected delays like an aircraft broke on the runway or excessive delays on refueling which might be avoided if you have enough fuel to divert.

TRANSIENT QUESTIONNAIRES. Knocking around the countryside and talking to Base Ops types we have come to the conclusion that only about 25 percent of the transient pilots are filling out the transient questionnaire. This is about the only tool that the bases have going for them except when I act as a go-between and forward comments that come directly to REX. Let's get with it and give the base something to work from. They are interested in improving their service, so let them know what's right and wrong. Your thanks for a good job does wonders for the transient troops' morale! ★



REX RILEY
Transient Services Award

LORING AFB	Limestone, Me.
McCLELLAN AFB	Sacramento, Calif.
MAXWELL AFB	Montgomery, Ala.
HAMILTON AFB	Ignacio, Calif.
SCOTT AFB	Belleville, Ill.
RAMEY AFB	Puerto Rico
McCHORD AFB	Tacoma, Wash.
MYRTLE BEACH AFB	Myrtle Beach, S.C.
EGLIN AFB	Valparaiso, Fla.
FORBES AFB	Topeka, Kans.
MATHER AFB	Sacramento, Calif.
LAJES FIELD	Azores
SHEPPARD AFB	Wichita Falls, Tex.
MARCH AFB	Riverside, Calif.
GRISSOM AFB	Peru, Ind.
CANNON AFB	Clovis, N.M.
LUKE AFB	Phoenix, Ariz.
RANDOLPH AFB	San Antonio, Tex.
ROBINS AFB	Warner Robins, Ga.
TINKER AFB	Oklahoma City, Okla.
HILL AFB	Ogden, Utah
YOKOTA AB	Japan
SEYMOUR JOHNSON AFB	Goldsboro, N.C.
ENGLAND AFB	Alexandria, La.
KADENA AB	Okinawa
ELMENDORF AFB	Alaska
PETERSON FIELD	Colorado Springs, Colo.
RAMSTEIN AB	Germany
SHAW AFB	Sumter, S.C.
LITTLE ROCK AFB	Jacksonville, Ark.
TORREJON AB	Spain
TYNDALL AFB	Panama City, Fla.
OFFUTT AFB	Omaha, Nebr.
McCONNELL AFB	Wichita, Kans.
NORTON AFB	San Bernardino, Calif.
BARKSDALE AFB	Shreveport, La.
KIRTLAND AFB	Albuquerque, N.M.
BUCKLEY ANG BASE	Aurora, Colo.
RICHARDS-GEBAUR AFB	Grandview, Mo.
RAF MILDENHALL	U.K.



Twice a year they come—like a gathering of the clan. But the occasion is not a celebration—although it has some aspects of a ritual. They are there for three or four days of head-knocking with one goal in mind: to ensure that USAF aircrews are getting the best possible life support equipment.

The participants are Life Support Officers from all the commands, and about a squadron of experts from the Life Support Program Office in ASD and the Life Support Systems Manager at SAAMA, Kelly AFB. The meetings are held alternately at Wright-Patterson AFB and Kelly.

The most recent conference was held at Kelly, 7-10 March, with the Systems Manager hosting the meeting. It began with presentations by Robert Shannon, Directorate of Aerospace Safety, on 1971 USAF ejection experience, and a preliminary summary of evasion and recovery experience in Southeast Asia. Shannon also discussed US Navy ejection experience with the ballistic spread parachute. Then the Command representatives took their turns at the podium. Mostly they stated problems and asked pointed questions about the status of required items such as new batteries for survival radios and beacons, better seat cushions, protective clothing, survival kits, helmets and so on.

But hardware is not the only subject. There was considerable discussion on the complexity of some of our life support equipment, the need for better education; questions on the adequacy of technical data and the need for abbreviated checklists for disassembly and assembly of items that require periodic inspection and replacement of components.

Many hardware items are straight-line efforts, from statement of a requirement, through development, testing, procurement and delivery. But other items present knotty problems. For example, there are explosive devices (cartridge and propellant actuated) used in a number of applications in survival gear. These are small and seldom present much of a risk even when inadvertently fired. However, they *are* explosives and have had to be stored and handled as such.

LSOs in the field would prefer to store these devices in the life support equipment shops, for convenience, rather than in a far-removed explosives storage area. The matter was discussed at length during the conference. However, AFM 127-100, 2 December 1971, now permits this. Paragraph 4-12 specifically references explosives items in egress maintenance shops, and paragraph 5-17 covers Class I quantity distance items. (For an analysis of the changes to AFM 127-100, see "Keeping Up With the Times," page 30, this issue.)

Since both the SPO and the SM reported on perhaps 75 items each, there is not room here to comment on all of them. However, we'll mention a few to give you an idea of what's coming down the road. It is suggested that your Life Support Officer could obtain a spot during your next Flying Safety meeting for a quick rundown on items of particular interest to you and your mission.

• Custom fit helmet liner. This has been in OT&E and the final report is due this spring.

• Dual lens visor for AFH-1 ballistic helmet and HGU-2A/P, and HGU-22P helmets—should be available in some areas by the time you read this.

• B-52 headrest spacers. The SM is providing drawings for local manufacture, with April target date.

• Rerouting of oxygen lines and hoses in T-33A. The routing has been not only unsatisfactory but a safety of flight hazard; it will be changed. Kits for TCTO are scheduled for delivery between July and September, 1972.

• Single motion ejection initiation systems for the F-105, -101, -100 and -102. All of these have been approved and modification should be accomplished on all sometime this year or early 1973.

• Egress system improvements for F-101, F-5/T-38, B-52, A-37.

Other items being considered, developed or tested include a new letdown plate holder for SAC, a seat with a sleeping bag contained in the seat cushion, quick single point har-

LIFE SUPPORT CONFERENCE

ness release, fire retardant material for parachute canopies, lithium batteries that tests indicate are superior to current batteries for survival radios and beacons, Ventile fabric exposure suits, Nomex jackets.

Perhaps the most significant project now in progress is the development of integrated life support systems that will emphasize the integration of all life support equipment functions from design through operation. The overall project includes development of subsystems to fit into the general framework of the integrated system. It is an ambitious and far reaching effort, but perhaps someday

Meanwhile, the engineers, technicians, managers and users of the life support equipment the aircrews depend on get together twice a year in their head-banging sessions that can't help produce a lot of good things.

You get a little better appreciation of the effort that goes into our life support equipment when you consider that:

All of your clothing, from boots to helmet was developed, procured and furnished in life support equipment channels. Likewise, your ejection seat, survival kit, that parachute strapped to your back, the beacon in your chute, the survival radio, flotation gear, restraint gear and oxygen system. These are just some of the many things that make it possible for the aircrew to operate with a certain amount of comfort and confidence that, when the machine fails, not all is lost.

ED. NOTE: Impressions of this conference by a first-time observer:

- Life Support Officers and NCOs from the Commands appear to really know their business and were very aggressive in stating their cases.
- There appears to be a need for the commands to be a little more definitive in stating requirements.
- Lead time on some new equipment and modification of existing items seems exorbitant (at least to a layman).
- SPO and AMA managers and technicians are highly competent and current; however, the system still seems to have some built-in inertia.

In sum, these meetings are excellent in that they bring together, face-to-face, representatives of the users, developers and managers. The payoff is a better break for aircrews. ★



TO SERVE THOSE WHO FLY

COL JOHN W. ORD, USAF, MC, Chief, Clinical Sciences Division

LT COL WILLIAM H. KING, USAF, MC, Chief, Flight Medicine Branch

School of Aerospace Medicine, Brooks AFB, Texas

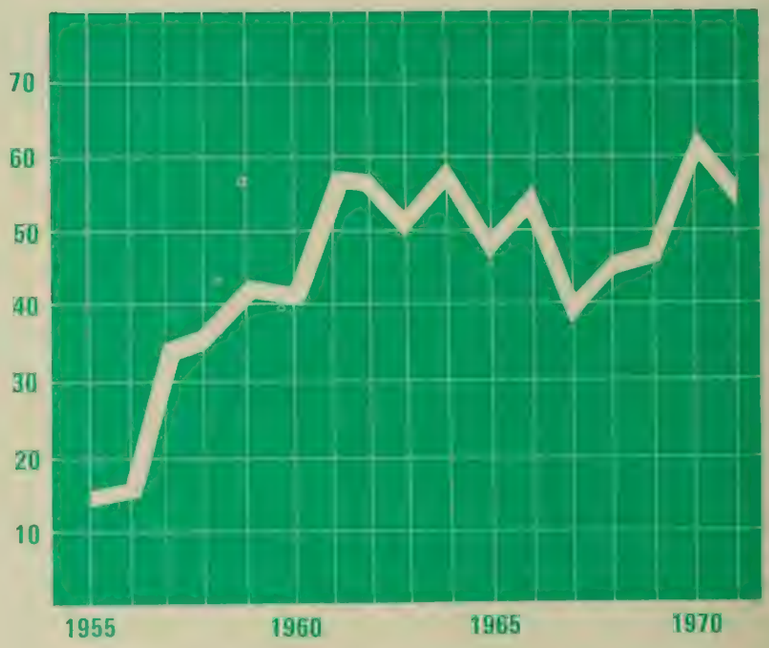


Figure 1. The percentage of patients successfully returned to flying status, following evaluation by the Aeromedical Consultation Service, is presented for fiscal years, 1955-1971.

"What's it like to be a grounded pilot? He is like a stranded fish. A traveler whose passport has been lifted. Grounded is a dirty word"

These phrases introduce a new Training Film (#6522), currently being distributed throughout the Air Force for showing at flying safety and medical group meetings. It focuses upon the *man* in the man-machine system and upon a unique organization which assists the Air Force in resolving difficult medical problems among flyers. The Aeromedical Consultation Service at the USAF School of Aerospace Medicine, Brooks AFB, Texas, exists exclusively "To Serve Those Who Fly," a reference to the school motto and the title of the new movie produced by the Aerospace Audio-Visual Service.

Recently case number 10,000 arrived at Brooks to begin a three-day outpatient evaluation. The Consultation Service schedules no patients requiring hospitalization, but still it gets no easy cases. One or several questions concerning the patient's health status must be evaluated with reference to the aerospace environment in which he works. Any finding which might compromise flying safety or the capability for completing the mission must be thoroughly scrutinized. But the investment in a trained aircrew member is also weighed carefully, with conservation of the combat-ready force a primary consideration.

Figure 1 depicts the return-to-flying rate for patients evaluated by the Consultation Service during the past 17 years. During the early years of the service, one-third or fewer of the patients were returned to flying duties. During recent years, a return rate of almost two-thirds has been achieved. Efforts are continuing to study borderline medical conditions to determine criteria by



A baseline EEG is routine for all pilots and navigators evaluated at SAM. Here technician Sue Matthews and Dr Ed Liske, Chief of the Neurology Function, monitor the patient's response to mild hypoxia.

which individuals may be returned to duty without compromise of flying safety.

The majority of patients referred to the Consultation Service are pilots and navigators. But other aircrew members, air traffic controllers, physiological training technicians, Air Force Academy cadets and allied military flyers are eligible for referral. Candidates for the Aerospace Research Pilot School and other special flying programs (U-2, SR-71) are also evaluated, as were most of the astronauts during the selection phases of the NASA space flight program.

But the typical patient arrives at the School of Aerospace Medicine (SAM) because of a medical problem. It may have come to attention because of symptoms or it may have been discovered during the course of a periodic physical examination. In either instance the evaluation has been initiated by his base flight surgeon and approved by the surgeon of his major air command. The referral procedures are outlined in Air Force Regulation 161-23.

The most frequent type of problem concerns the heart or the cardiovascular system. Heart disease is the number one health problem among the American adult male population and flying personnel are not immune to its hazards. A disabling heart attack occurring to a pilot at the controls of an aircraft could have obvious disastrous consequences. There have been a sufficient number of such events in civil aviation to make this a serious consideration and not just a fanciful supposition. Therefore, a large portion of the efforts of the Consultation Service are devoted to the early detection of coronary artery disease, the process of narrowing of the blood vessels which supply the heart muscle. Over two hundred patients per year are referred to SAM for evaluation of their cardiovascular status.



A complete evaluation of the patient's visual and ocular stratus includes a check of intraocular pressures, here demonstrated by Col (Dr) Thomas Tredici, Chief of the Ophthalmology Branch.

A key to the early detection of heart disease among the Air Force flying population is the USAF Central Electrocardiographic Library established at SAM in 1957. Copies of electrocardiograms, required for flying personnel upon entering training and annually after age 35, are funneled to SAM from throughout the Air Force. Over 700,000 records are currently on file, with an average of 125 new tracings received each day. Over a ten year period 72 cases of silent myocardial infarction, which might have gone otherwise unrecognized, were found upon review of routine electrocardiograms. But more commonly, comparison of serial changes in electrocardiograms from year to year give subtle clues as to the development of heart disease long before the appearance of clinical symptons, during the period when something can still be done to prevent its consequences and possibly to prolong the individual's flying career and life expectancy.

The second major category for referral to the Consultation Service includes problems related to the function of the brain or central nervous system, such as a disturbance of consciousness or history of a significant head injury. Vertigo, motion sickness, visual disturbances and emotional disorders are other common causes for referral.

In order to evaluate such problems, SAM is authorized staffing and equipment which are second to none in military medicine. Assigned



A special piece of equipment at USAFSAM is the Goldmann perimeter for the detection of any impairment in a pilot's field of vision. This study is being conducted by SSgt Dean Wright of the Opthalmology Branch.



The vectorcardiogram provides a three-dimensional look at the heart's electrical activity and supplements scalar electrocardiographic studies. The technician, Mr. Adolf Guzman, makes a permanent photographic record of the study.

physicians are trained in the specialties of areospace medicine, ininternal medicine (including cardiology, gastroenterology), ophthalmology, otolaryngology, neurology and psychiatry. In addition, consultations in other specialties are furnished as required at the nearby Wilford Hall USAF Medical Center. Special facilities at SAM include a low-pressure chamber instrumented for medical monitoring and for special x-ray procedures at simulated altitudes, and a human centrifuge to produce the accelerative forces of flight.

Tests at SAM differ from those usually performed at base level by the application of dynamic or stress testing in addition to baseline or resting studies. The testing situation and the results are made as meaningful as possible with reference to flying activities.

SAM is designated as a USAF repository not only for electrocardiograms but also electroencephalograms, recordings of the electrical activity of the brain. Sophisticated devices for the study of acoustical problems and the function of the inner ear or labyrinth and special photographic equipment for documenting diseases of the eye are included in SAM's space age equipment.

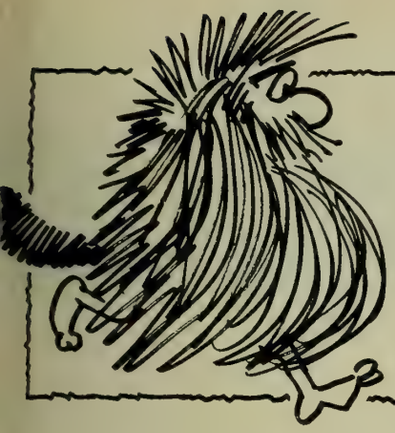
But the unique quality of the Consultation Service is the orientation of all members of the staff to the problems of flight operations and the total team approach to the evaluation of each patient. A flight surgeon is in charge of the over-all evaluation and brings together data and opinions from other specialties. Each patient has the undivided attention of his flight surgeon and consultants. Each case is presented to senior members of the staff at daily case conferences and the results reviewed by the branch and division chiefs. The Consultation Service does not take any short cuts. Each case is investigated thoroughly to the limit of medical capability.

The result in the majority of cases is a favorable recommendation for return to flying duties. With a continuous effort to refine criteria for measuring the effects of obscure disease, the trend is for greater numbers of patients to be returned safely to the cockpit. While the Consultation Service is not authorized to take final action with regard to the patient's flying status, a follow-up system is established to verify the decisions rendered by the Surgeon General and major air command surgeons.

The Aeromedical Consultation Service represents the focal point of the USAF Medical Service support of flight operations which rests on the foundation of the care rendered to each patient by his base flight surgeon. Unlike other medical facilities concerned primarily with the treatment of disease, the emphasis at SAM is placed upon the early detection and prevention of serious disorders.

In many areas there are opportunities for a flyer to help himself to decrease the risk of significant disease factors, e.g., by following a sensible weight control and exercise program, and by bringing medical problems promptly to the attention of his flight surgeon. Rather than delaying a checkup because of a fear of grounding (perhaps until a more serious complication develops), the flyer might take assurance that a dedicated effort will be made to resolve his problem and to keep him on flying status.

The Consultation Service recognizes that the Air Force mission is to fly and to fight with an alert and healthy pilot at the controls of each aircraft. ★



HAIRY TALES

I'M JOHNNY

During the Berlin Airlift it was not all uncommon for us line pilots to find ourselves scheduled with a behind-the-lines type who needed his four hours for the month. And, because of the perennial crew shortage, their help was greatly appreciated.

Anyway, I reported in the 14th Ops one dismal morning (this was SOP at Rhein Main), was assigned a block time and tail number, noting as I glanced at the scheduling sheet, that I didn't have a copilot. However, just as I was about to throw a snide remark across the desk at the dispatcher, in walked a Captain type wearing the usual scruffy sheepskin parka. His question, "Could I get a little flying time?" immediately filled the void on the scheduling sheet and during the introductions I learned that he was an expediter (a term coined by one of Tunner's minions to explain the presence on the ramp of a man who informed you that you weren't going to make your block time—a fact which you were already well aware of). Anyway, to make a long story short, we slogged out through the mud, found the airplane, preflighted it and had one last cigarette while the Polish DPs finished tying down the coal. I took the left seat, briefed my copilot and engineer and fired up. Although I noticed my right seater wasn't exactly familiar with the checklist, and also didn't exactly sound like Lindberg on the radio, I chalked it all up to lack of practice because of his ground job.

The takeoff was normal, if chewing up almost the whole runway can be considered normal, and off we headed toward Darmstadt clawing for altitude. As we reported over Fulda, the first streaks of dawn appeared and by the time we hit Peanuts, it was truly Charlie Fox Baker (as we used to say) and GCA did their usual prime job of pointing us at the runway. I flared over the graveyard and made a landing even I was proud of, discounting the roughness of the PSP.

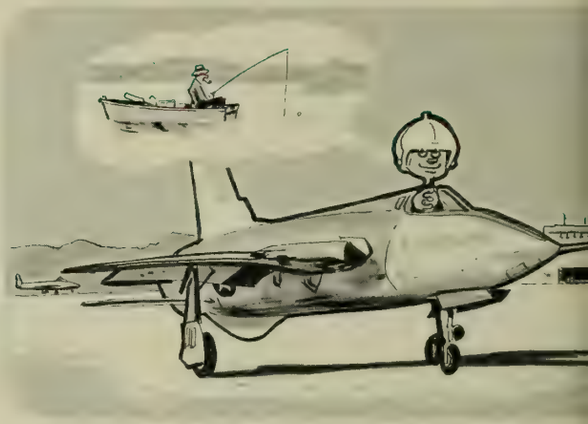
During the offload, while we were cocoaing up at the chow wagon, I asked my copilot if he wanted to take the left seat back to Rhein Main. He allowed as to how he'd enjoy that a bunch. I figured I would too, as his radio technique stank and he had a heck of a time managing the check list and GCA procedures at the same time coming in. Taxiing out, I again noted his obvious lack of practice in that he was rough as a cob on the nose wheel steering and when we stopped for runup, I actually thought he was going to collapse the nose gear strut! Fortunately, we were empty and there were no passengers walking around in the back end. Takeoff, considering all that had gone on before, wasn't too bad, really, although it took him about three thousand feet before he could establish any semblance of a steady climb speed. But, once we got to altitude and engaged George, his tracking etc. was damn good and we hit our checkpoints right on the money. Needless to say, all my previous IP experience and expertise were used in talking him through the approach and landing. Aside from one rather loud, terse remark relative to his "big flat feet off the brakes!" we didn't do anything to the bird to render it unflyable, and it was a tossup whether the landing should or should not have been entered in the Form 1 (781 to you zoomies). Frankly, I was more than a little relieved when he explained he had to get back to his jeep job and couldn't go another trip to Berlin. I lied when I shook hands and told him "I enjoyed it, let's do it again sometime," and he lied too and said, "Me too," and we both promptly forgot each other.

Epilogue: About a week later I happened to attend some function at the O Club and I ran into this same officer at the bar. He came up to me and shook hands, at the same time telling me how much he had enjoyed flying with me last week. It was then I noticed that his wings were peculiar—they weren't pilot's wings; they were navigator's! ! ! ★

__FLY ME TO BERLIN

Psychologica

WHEN YOU--



get complacent and decide that the sortie doesn't need your undivided attention.



just have to do something with your left hand after landing.

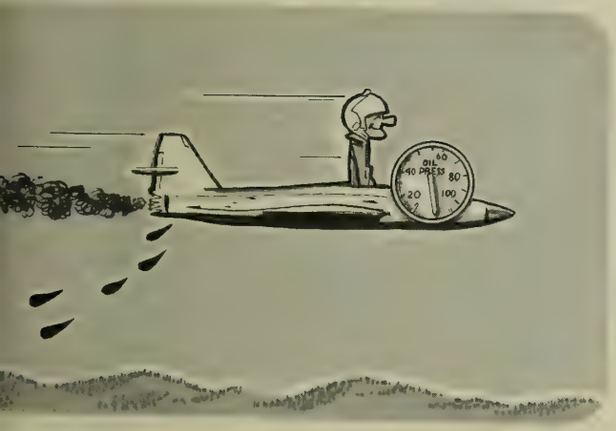


decide to heck with the weather, the flight is a real operational necessity.

SET



are determined to hit the target—with something!



assume the gage is wrong and "It'll probably be okay."



have made up your mind to land on the first attempt—no matter what!



ress on betting the weather forecast was rong.



are so fascinated with all the chatter on the radio and the flares going off, you forget the gear.

six flameouts later

Let's say you are in Maintenance and one of your birds develops what seems like an incurable disease. What would you do? Perhaps the following will provide some food for thought.

The first symptom of the disease started with a flameout of one of the engines on a T-38. The only thing you could find was low throttle cable tension which you corrected. Next day there was a repeat and again you adjusted the cable tension. Then number three flameout. This was getting serious, so you took the "if you can't fix it change it" approach.

The new engine seemed to have caught the virus because it promptly flamed out on two different flights. You reflect on the fact that two engines in the same bird have flamed out five times and decide that you had better go to the head doctor for guidance. Your major command comes down with directions to remove and replace the AB sequence valve, check engine alignment, check air seal clearance and rig the A-8 feedback cable.

Surely now, the patient will recover. And that seems to be the case during the FCF. About the time you relax, 1.9 hours after completion of the test flight you get the bad news. Yep, flameout number six.

Desperation sets in. You get the maintenance team together and announce that you are going to find out exactly what is wrong before you lose the patient. With tech data in hand you tear into the bird and come up with some very interesting ailments. The AB fuel control is out of rig. Fix! The right bleed valve is leaking. Fix! The right IGV rigging is out of limits. Fix! The AB sequence valve leaks. Fix! Engine alignment is 0.17 in. below maximum limits. Fix! The A-8 cable is out of rig. Fix!

Talk about sick birds.

Finally the patient is pronounced physically fit and ready to resume normal activities. You are happy to know that the bird is OR and making every scheduled sortie.

Think about this story. On six different occasions the lives of the crews were jeopardized and there was the possibility of losing the aircraft. That's pushing the odds a bit too far. You can shorten those odds on your bird by doing the job right the first time. ★

FUMES

in the cockpit

LT COL RUSSELL B. RAYMAN, USAF, MC, Directorate of Aerospace Safety

During the six-year period, 1 Jan 66 to 1 Jan 72, there were 55 reported cases of fumes in the cockpit. Forty-eight aircraft were involved: fighter (21), transport (17), trainer (9), helicopter (1). All the substances identified (see Table I) are, in some way, toxic and, therefore, threaten flying safety. Furthermore, a toxic substance is more dangerous in a confined cockpit.

TABLE I

Toxic Fumes in the Cockpit

Fumes	No. of Cases
JP-4	11
Oil	10
Electrical Fire	9
Oxygen Contamination	7
Carbon Monoxide	5
Unknown	5
Chlorobromomethane (CBM)	2
Hydrochloric Acid (HCL)	1
Naphtha	1
Ether	1
Methyl Ethyl Ketone (MEK)	1
Propane	1
Ammonia	1
TOTAL	55

It is unnecessary to delve into the pharmacology-toxicology of these noxious agents to make our point clear; a few generalizations will suffice. These substances can cause a number of symptoms to incapacitate a crewman: irritation and burning of the eyes, ears, nose, and throat; spasm of the larynx with difficulty breathing; headache, giddiness, and vertigo; nausea and vomiting; drowsiness and stupor. Often these symptoms are insidious. The pilot may notice the smell of "shoe polish" or "sweet air" and continue on the mission, slowly becoming dizzy and drowsy without realizing any performance decrement.

The fumes of JP-4, oil, or of an electrical fire may occur due to mechanical malfunction, and prolonged exposure may cause irritation of mucous membranes, dizziness, or stupor. These effects can be eliminated if the crewman, upon first detecting strange odors, begins breathing 100 percent oxygen or actuates the emergency bailout bottle.

In seven cases, the oxygen was contaminated by either methane, propane, ethylene oxide, paint, or dry cleaning solvent. In each case, the pilot reported an unusual odor during the flight. This can be particularly dangerous since the fumes are within the oxygen system itself. Therefore, there would be no alleviation with 100 percent oxygen. Only use of the emergency bailout bottle would be effective, or removal of the oxygen mask (providing cabin altitude was below 10,000 feet).

Carbon monoxide is particularly dangerous because of its toxicity. It can be formed by the incomplete combustion of organic compounds and it is often the by-product of fires. Although it is itself an odorless gas, other products of combustion that are simultaneously formed by fire do have an odor which warns one of impending danger.

The fumes of CBM, naptha, ether, MEK, HCL, and ammonia have been reported on transport aircraft. In most instances, storage containers were either improperly sealed or contained leaks. Crewmen transporting such dangerous cargo should be fully cognizant of its properties in accordance with AFM 71-4.

Of the 55 reported cases, two aircraft were destroyed due to fumes in the cockpit (carbon monoxide in an A-1E and electrical fire fumes in a B-57); several others narrowly averted disaster.

In summary, we aircrewmen must realize the potential danger of fumes in the cockpit. If foreign odors are detected, sound judgment rather than perfunctory disregard must dictate action. We do have alternatives: 100 percent oxygen, the emergency bailout bottle, removal of the oxygen mask, canopy jettison, abort if fumes detected on the ground and land if fumes detected while airborne. ★

ONE THAT DIDN'T HAPPEN

The cause of the following incident was internal failure of the aircraft battery. But the real story lies in how the pilot, through sheer professional competence, kept it at the incident level.

The aircraft was an F-4D, descending for landing at home base. During the descent, the rear cockpit suddenly filled with white smoke. Both crewmen selected 100 percent oxygen and the pilot dumped cockpit pressure, but the smoke didn't clear and the back seater was unable to read the checklist. The pilot made an immediate radio call to his wingman, informed him of the problem, requested a lead to home base for an immediate landing and turned his generators off.

When the generators left the line, the smoke stopped coming into the rear cockpit, the intercom went silent and the gear and flap indicators went "barber pole." The pilot suspected battery failure and extended the ram air turbine. Intercom was regained.

The crew turned off all electrical switches and checked all circuit breaker panels, but found no circuit breakers popped. The pilot turned on the generators again in an attempt to isolate the failed system, but smoke started pouring into the rear cockpit again and he turned them back off.

The wingman had declared an emergency and had led the F-4 back to the landing pattern. The pilot blew the gear down and made a no-flap, approach end, BAK-9 barrier engagement, engaging at about 150 knots. Rollout was normal, but rollback was experienced and the aircraft swerved toward the right side of the runway. The pilot applied left brake, but it didn't correct the right-side vector, so he immediately turned on his left generator to regain nosewheel steering, applied full left rudder to straighten the aircraft and turned the generator back off. After the fire engines arrived, he shut down the engines and the crew made a normal egress from the airplane.

Crew coordination, quick thinking and a thorough knowledge of aircraft systems saved the day—and maybe a bundle of dollars to boot.

ONE THAT BACKFIRED

Right after takeoff, at about 200 feet, the number two recip engine of the C-123K started backfiring. Normal procedures were used to shut down the engine, and the crew discovered during the shutdown that the mixture controls for both recip engines were in the AUTO LEAN position!

Ops

Both mixtures were returned to full rich, and number two was restarted and run at reduced power for the rest of the flight. As soon as restart was obtained on number two, number one recip started backfiring and it, too, was run at reduced power.

Due to the possibility that they wouldn't be able to get reverse power on landing, the crew diverted to another field with a longer runway, where the emergency landing was made without further incident.

It kind of makes you wonder what might have happened if they'd been in an unmodified 123 without the help those jet engines give. And we wonder why there's always someone who thinks he can do without the checklist!

COMMANDERS: Does this level of standardization prevail in your squadrons? This crew apparently followed checklist procedures only during their requalification check flights!

RO

AND ONE THAT FELL OUT OF THE SKY

The pilot was upgrading in the A-7, flying a transition mission with an IP flying chase. On final, the IP noted 16 units AOA. In the flare the A-7 suddenly experienced an excessive sink rate. The pilot tried to compensate by rotating the aircraft to an excessively nose-high attitude, and ended up dinging the tail cone and the aft engine removal access door.

Winds at the time were varying all over the compass at 10-20 knots. A good bet is that the pilot encountered a wind gust during the critical portion of his flare.

AOA is an excellent landing aid under normal, stable conditions. But during gusty wind conditions, the proper gust correction should be added to the airspeed, and the airspeed—not AOA—should be the primary reference.

Besides . . . the correct way to salvage a questionable approach/landing is to add power and go around.

topics

AFTER THE MIDAIR

If you have never had to do a controllability check because of structural damage, the routine may seem pretty cut and dried. The usual steps are to put at least 10,000 feet of air between yourself and terra firma, set up landing configuration, and slow to near landing airspeed. If in the course of this exercise the aircraft becomes difficult to control, we note the critical airspeed and decide between ejecting or attempting to land. If we decide to land, we remember the control difficulty airspeed and try not to get that slow again until the wheels are rolling. Simple, isn't it? Simple, that is, until we consider one critical factor: the rate at which airspeed is reduced during the controllability check may be the difference between a successful recovery and disaster!

In reducing airspeed we are not trying to locate an airspeed at which control authority is insufficient to sustain or regain a desired flight attitude. That is an uncontrollable airspeed, and when we get there the paragraph in Section III entitled "Ejection" applies. What we are looking for when we slow down is a zone between full controllability and zero controllability, an airspeed range in which the airplane is telling us that pretty soon it's going to give up unless we speed up. The width of this marginal zone may vary with the situation, so what we are looking for is the earliest possible indication that the aircraft is getting difficult to control. We note that airspeed and recover to the controllable airspeed range. The point, then, is that we must reduce airspeed at a cautious enough rate that we do not pass too quickly into the uncontrollable area. If we aren't cautious enough, the score can quickly become airplane 1, pilot 0, without the pilot even getting at bat.

FLIP CHANGES

VFR Supplement/Aerodrome Sketch Book—United States:

Effective with the 25 May 1972 issue, the VFR Supplement and AERODROME SKETCH BOOK will be combined into a single publication. The VFR Supplement dated 22 July 1971 was the last issue of that FLIP in the present format.

A Military Aviation Notice (MAN) effective to 25 May 1972 has been issued in lieu of the scheduled VFR Supplement for 1 Mar 72.

The AERODROME SKETCHES dated 9 Dec 71 was the last issue of that FLIP in the present format.

All holders of the aforementioned FLIPs are requested to take extreme care in their handling to assure extended life until the 25 May 72 issue.

A second reason for slowly reducing airspeed during the controllability check concerns the need for accuracy in determining the control difficulty speed. The decision whether to eject or land rests on the feasibility of attempting to land at higher than normal speed. It's also nice to know the exact "no lower than" airspeed during the actual landing approach. If your idea of this speed is only a vague WAG because of a hasty controllability check, you still run the chance of losing it in the flare.

Successfully recovering your aircraft after a midair collision or other structural damage can be a stern test of your mental and motor skills. You can help your odds with a properly performed controllability check at altitude. An essential part of this is the careful and deliberate determination of control difficulty airspeed.

(ATC Safety Kit)

JOLLY GREEN PILOTS' ASSOCIATION REUNION
9-10 June 1972
Ramada Inn, Fort Walton Beach, Florida

For information contact: Major Clyde E. Stowell, 39 ARRS Wing, Eglin AFB, Fl 32542. Phone 872-3593 or (904) 244-5217.

Ops topics

CONTINUED

NOT AWAKE YET?

It was one of those rainy, pre-dawn T-Bird launches. Everything seemed normal through the start, taxi, take-off and climb, but when the pilot attempted to level off he found he couldn't retard his throttle past 98 percent.

He returned to home station and tried a surveillance approach (viz was a mile and a half), but the ASR approach lined him up too far right for a safe landing. He cleaned up the airplane and headed for a place with better weather.

At the alternate, the pilot lined up on a precision final and cut the fuel shutoff switch about 250 feet in the air, when he figured he had the field made. The touchdown and rollout were routine.

Maintenance inspectors found the intake covers in the plenum area jamming the throttle linkage. Neither the pilot nor the crew chief had bothered to remove the duct covers during their respective preflight inspections.

It's sometimes not too pleasant out there in the cold, rainy dark. But a checklist and a flashlight can save all kinds of grief.

WHO OWNS THE RUNWAY?

A recent incident at a joint-use airfield spotlights a potential trouble spot which needs airing.

A USAF bomber contacted the FAA control tower, advised them of an unsafe nosegear indication and declared an emergency. The crew requested and received permission to make a fly-by for a visual check of the gear. Tower advised that the gear appeared down and cleared the aircraft to break to downwind for landing.

When the aircraft was on downwind the tower requested that the aircraft make a short approach. Soon thereafter, a commercial airliner reported south of the field and was directed by tower to maneuver for landing on an intersecting runway. Tower advised the airliner of the emergency in progress.

Tower then cleared the airliner to land and directed the USAF aircraft to turn base. The bomber did so, then tower asked that he delay his turn to final as long as possible. The USAF pilot delayed as requested, then advised tower that he was turning final.

The USAF pilot continued his approach. The airliner continued his approach and landed—as cleared—on the intersecting runway. The USAF pilot made a go around from short final, was cleared for closed traffic and landed without further incident.

There's a lot of pressure directed at tower controllers to keep traffic flowing smoothly, and we recognize that the expeditious flow of traffic—particularly commercial traffic—keeps everyone happy. However, USAF and FAA regs agree that, when a pilot declares an emergency, he's entitled to priority handling. A little lost time is a small price to pay for the resolution of an emergency—even for a commercial airliner.

WHEN IN DOUBT CHECK IT OUT

On the second leg of a dual cross-country mission, the student pilot noted symptoms of hypoxia and had difficulty breathing (cabin altitude was 17,000 feet). The student switched to 100 percent oxygen and performed a PRICE check, but had to loosen his mask to facilitate breathing. The IP initiated an immediate descent to below 10,000 feet cabin altitude.

The breathing difficulty persisted, even at the lower altitude, and the IP completed an emergency landing out of an instrument approach. Investigation revealed that the front cockpit oxygen regulator had failed internally, restricting oxygen flow in both the normal and 100 percent position, and that the exhalation valve in the student's oxygen mask had stuck.

But here's the kicker: the student had noted breathing difficulty during the first leg of the flight! And he neither mentioned his problem to his instructor nor took the trouble to check out his equipment on the ground during the stopover.

ED. NOTE: Obviously there was a deficiency somewhere. We find ourselves wondering whether the student just didn't realize the potential seriousness of the situation—in which case the training provided him is subject to criticism—or whether he wasn't able, for some reason, to communicate his problem to his instructor—in which case the atmosphere for instruction leaves much to be desired. ★

Toots

is interested in your problems. She spends her time researching questions about Tech Orders and directives. Write her c/o Editor, Aerospace Safety Magazine, AFISC, Norton AFB, CA. 92409.



Dear TOOTS

TO 00-5-1, para 1-2(b) states: "TOs published in the form of work cards must be referred to during operations and maintenance of systems" . . . "items on work cards will be referred to as that inspection item is accomplished."

TO 00-20-1, para 4-42 states: "the inspection work cards outline the minimum inspection requirements" . . . etc.

TO 1C-130A-6, para 4 of the introduction states, in part, "maintenance personnel should observe both the equipment being inspected and the components in the surrounding area" . . . etc.

From these references I learn that:

a. Work cards are considered Tech Data.

b. Work cards must be used as inspections are being accomplished, item by item.

c. It is expected that the mechanic will check the surrounding area and components for discrepancies.

d. That during inspections mechanics will be involved with components that are not on his work card, but in this case it is okay.

e. In many instances, work is accomplished with no real Tech Data at hand.

Would you like to comment?

Old and Grey and in QC

Dear Old and Grey

Yes, I would like to comment. First, let's say you are inspecting the engine nacelle, work cards in hand. The card requires inspection of the fuel pressure transmitter. While inspecting this item, you perform the surrounding area inspection and discover the fuel cross-feed manifold leaking. No, you do not need additional tech data to cover inspection of this item.

Now once the leak has been discovered, it should be documented in the AFTO Form 781. Once the discrepancy has been discovered and documented, then you must have specific tech data available during repair.

Toots

PRIDE

Pride in workmanship is the mark of a special type of individual. What I call pride is the man who, after completing a job, goes back over it again to make sure everything is just right. I am confident that a great majority of our maintenance people possess this quality. There are, however, a few who are causing the rest a lot of headaches. These few include both mechanics and supervisors. You have only to read a few of the incident and accident messages to start wondering what happened to the pride of these few individuals.

To show you just what I mean:

- An F-4 had completed combat tactics and during descent the pilot could not move the control stick to the right. After a straight-in approach and landing, a Wiggins clamp retainer was found lodged in the right lateral control bellcrank.

- Number two engine on a T-38 would not rotate during start attempt. A number four turnlock fastener was found lodged in the third stage compressor section.

I could list more; however, the basic point is clear. A little more pride in workmanship could have prevented both these incidents. So be a professional; take that second look and insist that the inspector take a good look before signing the forms.

Toots

Tech TOPICS

BRIEFS FOR MAINTENANCE TECHS

overtorque

The mission was complete and the B-52 headed home, when a muffled noise was heard coming from the area behind the forward pressurized compartment and the copilot noticed cabin pressure slowly climbing. The crew went to 100 percent oxygen, declared an emergency, and made an immediate descent.

During descent the number one fuselage overheat light came on. The left forward alternator was turned off and RAM selected. The overheat light went out following these actions.

Maintenance had overtorqued a bolt on the hot air line support bracket to the point of stripping the threads in the nut plate. The bolt separated from the clamp which allowed the duct to vibrate until failure occurred, releasing 16th stage air.

It is extremely important that the integrity of the pressurization system be properly maintained. Tech data should be closely adhered to, and that means right down to the torquing of the last bolt. Remember, a chain is only as strong as its weakest link.

double entry

During climb check the A-7D pilot noted that wing fuel was not transferring. He leveled the aircraft and selected wing emergency transfer, but the wing fuel still would not transfer. Then the A.C. generator failed and would not reset. The RAT was extended, wing fuel dumped and return to base accomplished without further incident.

The problem soon became evident. The motive flow line quick disconnect couplings had not been reconnected following a starter change. The CSD oil reached an over-temperature condition and caused CSD decoupling. (EDITOR'S NOTE: For you who are unfamiliar with the A-7 fuel system, motive flow is fuel under pressure which operates the ejector pumps for fuel transfer. The ejector pumps have no moving parts and operate on the venturi principle. Motive flow fuel is also routed through the oil cooler to maintain operational temperature of the CSD oil.)

During removal of the starter the maintenance man had entered "starter removed and motive flow lines disconnected" in the same block of the 781. **Corrective action was to reinstall the starter.**

TO 00-20-5, para 2-86, states that only **one** defect will be entered in each block of the 781A.

COMMANDER: *It took years to develop the maintenance and documentation procedures spelled out in tech data. In the SAFETY business we know the price of deviations. That IN-basket getting you down? Spend an hour with QC and Plans and Scheduling some morning. Get refreshed on Forms 781 management. Try it—you'll LIKE it! So will your unit.*

F-100 drag chute

When the pilot arrived at the aircraft the drag chute was installed, doors secured, and the safety pin attached to the side of the aircraft. During his walkaround the pilot climbed up and checked the sight hole. The cam and rollers appeared normal; however, the cable was noted coming out of the track at the retaining fingers where it goes under the butterfly doors. The pilot pushed the cable back into the track, and the compartment doors appeared normal with the lock pin secured.

On landing, the pilot was advised by the tower that his chute had dropped on the runway. The chute was recovered but the cable was missing. Maintenance had improperly locked the cable retaining jaws under the butterfly doors. The jaws had vibrated loose in flight allowing the cable to pull free. Due to the condition of the exhaust nozzle area it is believed that the cable had trailed behind the aircraft for some time before the nylon webbing frayed enough and the cable separated.

attention-prevention

Human error continues to take its toll in aircraft accidents and incidents. Often it is a case of some members of a team not knowing what the other members are doing, or in this specific case, not waiting until the all clear is given before proceeding with the operational check of an explosive system.

The aircraft was being prepared for loading of MK-82s. Voltage checks were completed at the wing stations and the crew moved to the centerline tank. One crewmember removed the tank safety pin, then reached into the aux air door area and discovered that the ejection gun cover was still installed, indicating the tank jettison system was armed. Before he could pass this information to the team chief, the team chief gave the signal to the cockpit man to actuate the switch. **The tank jettisoned.**

How could this explosive incident have been prevented? By following the step-by-step dearm and operational checkouts procedures in tech data. Personnel error set this one up in that the individual who dearmed the system failed to remove the centerline jettison cartridge. Personnel error also completed the chain that produced the incident. The team chief did not follow the step-by-step procedures in tech data. Deviation from tech data led to rush, and rush led to giving the signal to actuate the switch before all crewmembers had indicated they were ready.

wanted: good QC

LT COL DONALD J. SCHWENE
Directorate of Aerospace Safety

The C-130 was climbing in icing conditions. After the leading edge anti-icing checks were completed, the C-12 compass system indicated out of synchronization in MAG mode and remained intermittent and unreliable after resynchronization.

Investigation after landing revealed burned wiring for the C-12 compass, the leading edge anti-icing control, and the overheat and temperature indicating system. All bleed air and anti-icing manifold clamps in the left wing leading edge were loose and improperly torqued. The aircraft had recently been returned from a depot level maintenance facility.

This incident illustrates the necessity for stringent quality control at all maintenance levels up to and including depot.

C-123 oil leak

Everything was normal throughout the functional check flight on the C-123 until just prior to landing, when the number one propellor began leaking oil. The engine was shut down.

The problem was a defective spider hub (with a flat spot) that

was installed in the oil control, which allowed the seal to leak. This incident was caused by lack of attention to detail during assembly. This and similar incidents indicate superficial attention to work requirements on the part of both maintenance technicians and supervisors.

F-4 gear problem

During GCA approach, when the landing gear handle was placed down all three gear remained up and locked. The circuit breaker was checked and cycled and the gear handle recycled, but the gear still failed to extend. The emergency extension system was selected and all three gear went to the down and locked position.

This F-4 had just returned from IRAN when TCTO 924 had been completed. During this TCTO, wire bundle 53-79252-124 was routed through the landing gear switch instead of over it, as required by the TCTO. This improperly routed wire bundle prevented the down switch from making electrical contact when the gear handle was placed down.

This incident was a clear cut example of not following technical directives. If the mechanic had taken the time to follow the procedures in the TO, rechecked his work after completion, and insisted on a second set of eyes checking the work, this incident could have been prevented.

despite the checklist

Two egress technicians, call them Chuck and Sam, were dispatched to remove the rear seat from a T-38 for a "G" suit hose change. The seat was dearmed in accordance with 1T-38A-2CL-1, Chuck reading the checklist and Sam performing the actual work.

Following seat dearming, the seat removal sequence was started in the same manner; Chuck read the checklist and Sam performed the task. After completion of item 12, Sam stood in the cockpit facing aft and proceeded to lift the seat. As the seat reached a point approximately 12 inches above the full-up position, the lap belt M-32 initiator fired.

How does an incident such as this occur? Let's go back and take a look at just what happened.

During the dearm sequence when Chuck called for the M-32 lap belt initiator safety pin to be installed, Sam installed the pin around the communication cable next to the initiator and, when the seat was raised, the initiator bell crank contacted the oxygen quick disconnect body and activated the initiator.

How can this type incident be prevented? This unit has instructed all egress personnel to inspect the installation of the safety pin with a mirror during the dearming sequence. They will also tie the safety pin streamer to the oxygen hose. Sounds like a good idea.

torque it, tiger!

A review of recent incident reports indicates we are having the same old problem of many maintenance troops not using torque wrenches as required by the tech order.

Why will a maintenance man use the tech order to install an item or make rigging adjustments, then fail to follow it while torquing the item?

Here are a few examples of incidents involving improper torquing we receive daily.

- F-4D. PC-1 hydraulic failure in flight. The PC-1 pump return line was found loose. The threads had been stripped from over-torquing
- T-37. Overheat light on in flight. Hot air leak due to insufficient torque on bleed air line clamp.
- B-52G. Number one engine oil pressure fluctuation; engine shut down in flight. Oil filter assembly drain plug stripped by over-torque.

Supervisors, how do your shops measure up? Do your troops fully understand and follow the instructions in the tech order? How do you verify your torque wrench calibration? Reference TO 32B14-3-1-101.

Tech TOPICS

crew chief

The next time you preflight your aircraft ask yourself a few questions. Am I preflighting the aircraft in accordance with tech data? Or am I using untested and unproven methods? Am I giving 100 percent of my attention to the job or am I just going through the motions? When you sign the 781, ask yourself if there was anything more that you could have done to make this a safer flight. **Would you strap in behind the pilot with no second thoughts as to the condition of the aircraft?**

Remember before you were designated a crew chief, you had to exhibit certain qualifications, such as knowledge of the aircraft and its systems, proper use of tech data; you were also judged on personal qualifications such as integrity, maturity and sound judgment.

The supervisors who designated you a crew chief were confident that you possessed these qualifications. Don't let them down, prove in every task you perform that you are the professional crew chief they judged you to be.

cross-threaded "B" nut

Immediately after liftoff, the F-4 pilot noticed that airspeed was not increasing normally and vertical velocity was less than normal. As the climb continued the airspeed slowly decreased to zero. A T-39 joined up and accompanied the F-4 during the landing approach.

Cause: The pitot static system failed due to a leak at the pressurized compartment bulkhead fitting. The "B" nut that connects the hose fitting was cross-threaded. So what's the answer? How do we prevent cross-threading? The answer would seem to lie in well-trained, conscientious people and first-class supervisors.

airborne quality control

The gages were all in the "go" range as the FCF pilot released brakes, and the T-38 accelerated for takeoff. Line speed—good; liftoff—just right. The FCF card ought to be nothing but check marks on this one. Gear up. No problems. Wait a minute, now. The red light is still on in the gear handle. And what's that funny noise? Rats! Must have a gear door hanging. Out of burner, gear down, and uneventful landing.

Troubleshooting quickly revealed that the gear torque actuator hoses had been improperly connected. They had been crossed, which is a clearly stated "no-no" according to TO 1T-38A-2-8. Considering the frequency of maintenance error occurrences resulting in premature mission terminations, this one would be hardly worth reading about, except for one nagging thought. How did the red X get cleared?

Now we are looking at not just one man's mistake, but two. One man did the work wrong, and another looked at the work and said it was right. And there is more. We wonder how the bird got through the ground operational check for gear retraction. Or did it even get a retraction check? TO 1-1-300 says it should have.

The accident prevention argument in this regard is simple. We don't like it much, but we have to agree that "to err is human." That is why we have quality control. That is why we need well qualified people to inspect work and sign off red Xs. That is why we require system ground operational checks. If we can catch these human errors on the ground we will prevent maintenance factor flight accidents.

(Adapted from ATC Safety Kit) ★

EXPLOSIVES

KEEPING UP

SOME IMPORTANT CHANGES IN AFM 127-100

The cover of the new AFM 127-100 looks just like the old one, but in between there are many important changes. Some of the more significant changes are listed below, in chapter-by-chapter form. Of course, a thorough study of the new manual is a must for everyone involved with explosives.

CONTENTS:

- The contents section has been expanded, and the index in the back of the book has been deleted.

CHAPTER ONE: *Introduction*

- A whole new section has been added covering administration, engineering, training and evaluation.
- The commander must appoint a *qualified* safety representative to manage the program.
- Each organization involved with munitions must appoint both an Explosives Safety Officer *and* an Explosives Safety NCO.
- More detail is devoted to the requirements for Unit OIs.
- The Base ESO must maintain a map showing locations of explosives by class and quantity, clear zones, transport routes, and waivers and deviations.
- The Wing/Base Commander must provide for a formal inspection of all explosives locations at least once per month. Inspection guidance is now included here, rather than in TO 11A-1-41.

CHAPTER TWO: *General Safety Precautions*

- Live explosives may not, of course, be placed on static display. It is now also prohibited to render live explosives inert for that purpose; static displays must be built up from inert components.
- Explosives area boundaries must now be posted at 300-foot intervals, rather than 500-foot intervals.
- Information on waivers and deviations is now included in Chapter Eleven.

CHAPTER THREE: *Fire Protection*

- It's now mandatory that each fire station maintain a map showing all explosives areas and their applicable fire symbols and hazard markers.
- All personnel likely to be involved in firefighting or munitions storage must be trained in the interpretation of symbols and markers.
- Locations having 1000 rounds or less of Class 1 small arms ammo need not be posted with fire symbols nor posted on the fire stations' maps.
- General parking areas must be at intraline or greater distances from explosives locations.
- All operating support equipment, including portable air compressors, generators, etc., should be located 50 feet or more from explosives.
- Wording has been expanded on chemical munitions warning signs, making the identification of various munitions easier.

CHAPTER FOUR: *Storage*

- It is no longer permissible to use excess magazines for storing general stores. A segregated area must be set aside *exclusively* for the storage of explosives.
- It is no longer required to post AFVA 127-2 at storage spaces inside the base explosives storage area.
- Flammable liquids *may not* be stored with explosives.
- More detailed instructions have been included pertaining to storage in explosives assembly operations, egress shops, gun shops and chemical agent storage areas.
- Storing Class One and Two Munitions with riot control and smoke agents is now authorized.
- Non-lethal chemical munitions may be stored with other munitions under the Group 100-2 provision.

CHAPTER FIVE: *Quantity/Distance Criteria and Related Standards*

- The chapter has been extensively revised to present material in an orderly sequence.
- All "(T)" class designations have been deleted.
- There are significant changes in table 5-10 and Class Seven explosives, and in the tables for hazard group IV missile launch and propellant static test installations. Close review by those involved is warranted.

GORDON S. TAYLOR, Directorate
of Aerospace Safety

SAFETY WITH THE TIMES

• Class Seven POL safety distances must now be computed on the basis of unbarricaded stores.

• Quantity/Distance criteria for concrete-covered aircraft shelters has been added to the chapter.

CHAPTER SIX: *Electrical Hazards*

• Electric power transmission line standards no longer apply to miscellaneous explosives locations such as survival equipment rooms, egress shops or arms rooms.

• The point of measurement is now from the nearest *conductive* point on the building (metal window frames, lightning arrestors, metal doors, etc.)—not from the nearest point on the building.

• The agency which tests munitions storage lightning protection systems must now furnish a copy of their report to the user, so that he may document compliance with inspection criteria.

• Specific details and requirements are given for grounding aircraft for explosives load or unload operations.

• The section covering hazards of electromagnetic radiation has been revised. Of particular note are the shorter distance considerations and the computation of electro-explosive device safety distances. An easier-to-use nomograph is provided.

CHAPTER SEVEN: *Transportation*

• The manual now requires that hazard classification be assigned to explosives prior to any transportation.

• Additional guidance is provided for controlling incoming explosives shipments.

• On-base explosives movement routes must be designated and must avoid built-up and key facilities.

• Environmental/ecology controls have found their way into the manual; note that the maximum carbon monoxide concentration for any eight-hour period has been reduced from 100 parts per million to 50.

• Only one fire extinguisher is now required on each transport vehicle (although two are still preferred).

• Data have been included for placarding vehicles transporting chemical munitions and vehicles in host-nation countries.

• Explosives-loaded vehicles may not be held more than 24 hours in holding yards.

• Extensive changes have been made in the portions covering vehicle delivery and rail shipment of munitions.

CHAPTER EIGHT: *Site Plans, Construction and Utilities*

• The manual now requires submission of site plans for bare base and limited base locations, with allowance for operational contingencies.

• Reinforced concrete walls have been further devalued to 425 pounds per single cell (better check your multicubicle magazines).

• Sandbag type walls have been reduced from the formerly required six feet to five feet thick.

CHAPTER NINE: *Chemical Munitions and Defense Biological Research Samples*

• Information on chemical markers and firefighting procedures have been moved to Chapter Three.

• The new binary chemical munitions are now covered in appropriate sections of Chapter Nine.

• The chemical hazard symbol "D" is no longer required for napalm munitions, and Smoke Signals require no chemical symbols (except for HC Smoke, which needs the symbol "B" plus a single diagonal).

• References to use of copper sulfate in first aid kits have been dropped.

CHAPTER TEN: *Manufacturing and Loading of Explosives*

• No significant changes.

CHAPTER ELEVEN: *Waivers and Deviations*

• Provides expanded guidance for preparation and submission of waivers and deviations.

• Much of the information in Chapter Eleven was drawn from the old Chapter Two, but it is easier to locate now that it is in a separate chapter. ★

ENGINE MAINTENANCE RUNS

Each year valuable USAF assets are destroyed or damaged during maintenance engine runs. Almost without exception the individuals involved either were not fully qualified for the task or omitted a portion of the engine run checklist.

What constitutes a "qualified" individual? AFR 60-11 spells out the basic requirements for aircraft operation on the ground for all personnel.

This regulation states: ". . . no person may start, operate, warm up, or test engines installed in aircraft except:

"(1) Rated or student pilots who have been checked out in the particular aircraft or who are being supervised by a qualified instructor pilot or flight examiner.

"(2) Qualified mechanics who have:

(a) Familiarized themselves with the flight manual for the aircraft and engine involved.

(b) Received practical instructions in starting and ground operation of engines on aircraft involved, operation of brake systems—both normal and emergency—and radio operation and procedures.

(c) Demonstrated their proficiency to one of the following: a qualified maintenance officer, maintenance superintendent, standardization/evaluation flight engineer/mechanic, or instructor pilot who will certify the qualification by making an entry in the records of the airman concerned."

Annual requalification is mandatory unless required more often by the individual's supervisor. Maintenance supervisors, quality control personnel, and safety officers should make this area an item of interest to insure only qualified individuals are operating their aircraft and engines.

(TIG Brief No. 4, 10 Mar 72)



"NEAR MISSED APPROACH," FEB ASM

I read with interest the "Near Missed Approach" article on page 18 of your February 72 issue. Your statement, "no one on this crew had a very high regard for his own safety or for the loss of combat effectiveness," may be an unfair appraisal. Although the pilot should have initiated a missed approach sooner, especially if he were in a rain squall area and advised to do so by GCA, he nevertheless may have read his altitude as much higher than he actually was.

We all remember that question on the annual instrument written test about flying into an area of lower pressure. It asks, "are you higher or lower than your altimeter indicates?" The answer, of course, is that you are lower than the altimeter says you are.

I have had at least two rather hairy experiences on final approach where my altimeter told me I was well above DH for a PAR but in reality I was just about flying into the ground.

The B-66 pilot made a mistake by continuing his approach under the circumstances and transitioning to TACAN at only three miles f the field. However, I really wo if the altimeters on the airplane dicated anything near terrain l when he struck the power line.

Yes, we can learn something f this incident—when the GCA troller says "radar contact lost" one is in heavy rain, especially sq type rain, he should not rely on altimeter for accuracy. Lots of th are happening in a rain squall one of these things for sure is possibility of a very inaccurate tude indication.

Lt Col Tom Doyle
McChord AFB, Washing

Your point is a good one; r barometric changes near the gro can be very dangerous. No one the crew in question, however, nied or rebutted the contention they all allowed the aircraft to scend below minimums. The phr "TACAN Approach/Missed proach" was taken from the pil testimony, and indicates to us he was putting off making a decis until he saw how things worked —and that attitude has cost us a over the years.—ED.

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UNITED STATES AIR FORCE

WELL DONE AWARD

Presented for outstanding airmanship and professional performance during a hazardous situation and for a significant contribution to the United States Air Force Accident Prevention Program.

Sergeant LEWIS A. LOPES



523d Tactical Fighter Squadron, APO San Francisco 96274

On 16 July 1971 Sergeant Lopes singlehandedly extinguished a tire and brake fluid fire on a C-118 aircraft. As the C-118 was preparing to take the active runway, Sergeant Lopes, who was chief of the quick-check arming crew, noticed that the left main tire had caught fire. He immediately ran in front of the burning aircraft and signaled the pilot to stop. By this time, spraying brake fluid had fed the fire, and flames were shooting out the rear and above the aircraft's landing gear, threatening the wing structure. Sergeant Lopes took a fire extinguisher, rushed to the landing gear and extinguished the flames.

Sergeant Lopes' alert response to this emergency saved a valuable aircraft from further damage or destruction and prevented the aircrew from suffering injury or loss of life. WELL DONE! ★

USE IT 

OR

LOSE IT




UNITED STATES AIR FORCE • JUNE 1972
Aerospace
SAFETY



COVER—oil on canvas. One of a series of paintings contributed to ASM by well-known aviation artist Douglas Ettridge of Surrey, England, and Santa Barbara, Calif.

UNITED STATES AIR FORCE **JUNE 1972**

Aerospace SAFETY

FOR AIRCREWS, MAINTENANCE & SUPPORT TECHNICIANS

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SIXTEEN TONS

Maj WALTER I. BOSTWICK, HQ USAFE

"Excuse me, Major, but aren't you flying this evening?" Major Bud Johnson sighed and glanced at his watch. "That's right, thanks for reminding me. I'm so far behind with this paperwork I'd forgotten all about it. Please button up the shop, Sergeant—see you in the morning."

As Bud drove toward the flightline, he reflected that the weatherman had been right. The ceiling and vis were still good, but light rain had started as scheduled and the gray afternoon foretold of layers and layers of clouds. "I sure hope we can top this stuff," he mused. "If not I'll be a tired boy after 2.3 of night wing weather."

Major Bud Johnson was, in fact, a pretty tired boy already. After years of learning the ins and outs of squadron operations, his new job in ops and training was both strange and trying. Early mornings and late nights had become his routine, and still too much of his work came back from the DO with the note:



SIXTEEN TONS

CONTINUED

"Good start. Scrub it down again, coordinate with the DM, and run with it."

It was a quarter to five when Bud walked into the squadron—plenty of time to climb into a flight suit and scan the FCIF before briefing.

Suited up, he checked by the duty desk. "Are we going to have some birds tonight?" he asked. The duty officer quickly checked the schedule board. "Looks real good as far as the aircraft are concerned, but the tankers may be called off because of weather. We're waiting for the command post to get that finalized and will let you know as soon as we can."

After filling his coffee cup, Bud joined his GIB and the other crew in the flight briefing room. He was greeted with a cheerful "Hello, wing weenie" from his old squadron mates and retorted with a short comment on their backgrounds. As Bud took his seat, the flight leader began the briefing. Once the time hack and aircraft assignments were made, Bud's thoughts drifted to other things.

"I wonder if I was smart to take this job," he thought. "The timing was certainly bad. Here it is the start of summer and the whole family was really set on taking that leave. The boys have been working on getting the camper squared away and the wife has enough travel books to choke a horse. But there was just no choice. If you pass up a chance to move up, you just don't get another. Maybe next year."

The duty officer interrupted the briefing with news that the refueling part of the mission had been canceled. "Sorry, but weather has PIREPS that this stuff is fairly well layered up to over 30 thou. The field should hold up fine so the mission can go—just no tanker square to fill."

"That's just great!" the flight leader exclaimed sarcastically. "We all have more than enough night time—the tanker was the only reason we were going to fly anyway. Just abso-bloody-lutely great! Now we can bore holes for 2.0."

The briefing was quickly concluded. After minor changes in EACs and a quick check on the flight plan were made, there was still time for a final cup before going out to the aircraft.

Captain Joe Miller was flying with Bud. A sharp WSO with more than two years in the squadron, he sensed a change in Bud's usually outgoing manner. "Bud, you're being awful quiet. Anything wrong?" he asked. "Your wing job can't be all that bad."

"Well, it's more than I figured it would be, but what really tears it is the fact that the boss is leaving in a couple of weeks and the new guy won't be in for over a month, so I had to cancel my leave."

"I'll bet the dearly beloved was torqued down pretty tight when you told her about that!"

"She sure was—and still is," Bud replied. "But she'll get over it after a while. She's been around the Air Force long enough to know that these things happen. Well, I guess it's time to get on with the flying business—the fun and games of a night round-robin!"

With a final pit stop and the usual pocket-slapping check to make sure gloves and other miscellaneous gear were on hand, the flight members hopped in the bread truck for the ride to the aircraft. A few words and a reminder from the flight leader: "See you on button eight at three zero."

The preflight went rapidly, the way they always do when it's raining. Once in the cockpit, they ran the checklist items down to engine start.

"Well, it all looks good to me," Bud muttered. "I wonder why the bird always breaks when it's day VFR and on a night hole-boring mission you can't find anything wrong even if you try. I'd much rather be sitting at home right now than strapped to this machine."

"Yeah, I know what you mean," said Joe. "I've got a date with a real honey tonight and I'll be dragging so much after this that I'll hardly be sociable."

Engine start and the after-start checks passed quickly, and they followed lead to the quick-check area. "Say, Bud, it took eight minutes to get an alignment after the heat light went out, and the ground speed is up to 50 knots already. INS may not be too shiny tonight."*

"Rog. Everything else seems OK except that we don't have a TACAN lock-on yet—it should be there, but let's give it a couple more minutes."

The quick-check progressed with its usual boredom and lead's thumbs-up was returned. Switch to tower freq—check-in—ready to go. "Cobra Flight, this is Tower, hold one. The SOF is checking with command post."

Bud and Joe wondered aloud about what the SOF might have in mind. Maybe the tanker would make it after all.

"Cobra, this is the SOF. Bring 'em back in and shut 'em down. The TACAN is off the air. Maintenance says it'll be a couple of hours before

**Reference is to Inertial Guidance System.*

they can get it back on. The mission's canceled."

"Another practice engine start—great fun!" Bud remarked. "Let's clean it up and head for the barn."

Taxi back—chocks in—throttles off. "Let's get out of this old girl, Joe. See you on the ground."

While waiting for the other crew to join them in the truck, Bud and Joe were strangely silent. Then Joe said, "Bud, I don't want to shake you up, but do you realize that your lower ejection guard wasn't up when you climbed out?"

"You're kidding?! Damn, I'm glad I didn't hang a leg strap in that beauty. I may not be too sharp tonight, but that's one thing I never thought I'd forget."

"Bud, I know you want to get home, but would you mind stopping by the club with me for a cool one. There are some things I need to talk to you about. You know, kind of privately."

"Sure, Joe, but only one. It's too late for dinner with the kids, but if I hurry I'll have a little time with them."

Driving toward the club after a short debrief, Bud wondered what kind of problem Joe might want to talk about. "Joe's a nice kid," he thought. "Probably got girlfriend troubles and I guess he thinks I have all the answers. What a laugh!"

Joe was already seated at the nearly deserted bar when Bud walked in. The bartender served a frosty mug as he sat down. "What's troubling you, Joe. One of those sweet young things trying to pin you down?" Bud jokingly asked.

"Don't take me wrong, Bud, but it isn't me with the troubles—it's you. Tonight you really scared me. I knew you were tuned out at the briefing, but I wasn't really concerned until you blew three or four items on the checklist. Honestly, I was damned glad we aborted!"

With a sigh, Bud glanced around and then took a long sip. "It really shows that much? I thought that with as much time as I have in the bird I'd be able to fly a simple mission without any trouble. The problem is that I'm tired. Oh, I could pass a flight physical right now—it's just that everything seems to be piling up and there's no light at the end of the tunnel."

"Bud, why don't you hang up the old G suit for a couple of weeks. Tell squadron ops you need a little time off from flying."

"Joe, the wing type that always checks the weather and then finds his staff meeting schedule getting tighter as the ceiling's getting lower has always shown me nothing. What's more, when the squadron finds out that they can't depend on you and knows that they're going to pick up a deviation about half the time you're on the schedule, then you can just kiss the good flights goodbye. Not for me."

"Bud, you'll end up in a smoking hole with some poor GIB three feet at six o'clock if you don't stop trying to play superman."

Bud waved to the bartender and signaled for two more beers.

"You're right, Joe, and thanks—I mean it, thanks. It's hard after all these years to admit that I can't hack it, but it's true. I appreciate how you must have been gritting your teeth this evening and will make one promise—I'll never try to hack a mission again when I know I'm not in shape, either mentally or physically, to do a first-rate job."

"Sounds great, Bud. When you get back on the schedule, count on me for your back seat, OK?"

"It's a deal." ★





THE I.P.I.S. APPROACH

By the USAF Instrument Pilot Instructor School, (ATC) Randolph AFB, Texas

WHAT'S IN A NAME?

The designation of an instrument approach procedure can be a source of confusion to pilots.

STRAIGHT-IN PROCEDURES: Naming a straight-in procedure is fairly simple. The identification of such an approach must include the type facility which provides final approach course guidance and the runway to which the final approach course is aligned; for example, ILS RWY 18, TACAN RWY 23, etc.

CIRCLING PROCEDURES: Approaches which do not meet the criteria for straight-in minimums are identified by the type facility which provides final approach course guidance plus an alphabetical suffix. Examples are: VOR-A, NDB-A, etc.

DUAL FINALS: The charting specifications permit two final approach courses to be portrayed only on military approach procedures. The name of the procedure will include both navigational facilities. The full name of the procedure is normally used in air traffic control and the type of final approach actually flown is left to the pilot.

HIGH vs LOW: Virtually all high altitude approach identifications are now preceded by the letters "HI." This was done to prevent misidentification and possible confusion with low altitude approaches. Numbers will be used where there is more than one approach using the same facility for course guidance to the same runway; e.g., HI-TACAN 1 RWY 18R, HI-TACAN 2 RWY 18R, etc.

VORTAC: A VORTAC navigational facility may be used for either VOR, VOR-DME, TACAN, or VORTAC approaches. The name VORTAC used in an approach identification implies that the approach may be flown using either VOR-DME or TACAN equipment and that DME is required. DME is not required to fly a VOR approach based on a VORTAC facility though the pilot should use available DME information in order to remain position oriented.

NDB is the abbreviation for Non-Directional Beacon, a general term encompassing both low frequency and UHF radio beacons. Where the approach name does not specify either ADF or UHF receiver requirements, check the transmitter frequency to be sure. For example, 283 (kHz) would indicate a low frequency NDB and 283.0 (mHz) would indicate a UHF beacon.

Under the present system the approach identification might not include the facilities required for maneuvering prior to final approach. For example, a HI-ILS procedure would require VOR, TACAN, ADF, or DME in order to fly the approach as published. The pilot must study and analyze the approach he intends to fly to insure that it is compatible with the equipment aboard his aircraft.

Remember that you may not fly an approach for which there are no minimums published for your aircraft. The appropriate category minimums must be available and you must use the appropriate navigational guidance. Thus, you may not use TACAN to fly a VOR approach based on a VORTAC facility.

"FL 180" WHERE ARE YOU?

SITUATION: High altitude penetration. IAF altitude is *FL 180*. You are holding at FL 190. Local altimeter setting is 29.86" Hg. When you are cleared for the approach, you may:

A. Descend immediately to FL 180, proceed to IAF, and begin the approach.

B. Maintain FL 190, proceed to the IAF, and begin the approach.

Minimum usable flight levels, discussed in FLIP Section II and IFR Supplement, are established in 500-foot increments. However, only 1000-foot increments are normally used in air traffic control. If the controller clears you for an approach from FL 190 (such as described above), delay your descent and your questioning of his motives until you check the local altimeter setting. Clearance for the approach includes clearance to the altitude from which the approach begins. The only trouble is, sometimes FL 180 just isn't there. The USAF IPIS discourages the use of FL 180 in the design of instrument approach procedures for this reason. (The correct answer is "B.")

HOLDING (TIMING)

Until the last issue of AFM 51-37 was published, there were no written words to tell the pilot exactly when to start timing the inbound leg of a holding pattern. The manual now states,

> "Start the inbound timing when the aircraft crosses the holding course inbound or wings level, whichever occurs first." (Page 11-38)

Judging from the calls and letters, these words are apparently causing more "heartburn" than any others in the manual. In an effort to clarify the situation, let's look at three possibilities:

1. You undershoot the holding course. Start timing when you are wings level with an intercept established.

2. You overshoot the holding course. As you cross the holding course, your heading is **not** within 90 degrees of the holding course. Start timing when you are wings level with an intercept established.

3. You overshoot the holding course. As you cross the holding course your heading **is** within 90 degrees of the holding course. This constitutes crossing the holding course inbound so start your timing at that point.

Timing the initial inbound leg of a holding pattern is somewhat inaccurate at best. For inbound timing to be valid, the outbound timing must start at the proper point and the aircraft must be reasonably close to course at the completion of the inbound turn. The pilot should use the available techniques to position his aircraft so that the turn inbound will place the aircraft on the holding course. Accurate and valid timing may not be possible until the second circuit of the holding pattern. This will be further clarified in Change 1 to AFM 51-37. ★

A MATTER OF HABIT



The Hairy Tales column is open to anyone who has a message concerning safety, but would like to remain anonymous. If you have one of these experiences buried in your bosom, write it down and send it to us, signed or unsigned. Maybe your* HAIRY TALE *will save someone's life.

Man is a creature of habit. The fact itself is indifferent—it neither helps us nor hurts us. But properly applied—i.e., in the conscientious effort to cultivate beneficial habits—the ability can be a tremendous boon.

Back in Colorado, while I was in college, one of the local boys' clubs sponsored a seat-belt installation campaign. The statistics on the benefits of seat-belts were just then reaching the irrefutable stage, even to a liberal arts major, and my wife and I decided to have them installed in our 1954 Chevvy. We weren't willing, however, to spend the money and then end up with seat-belts that were cut and crimped from having the door closed on them or dirty from lying on the car floor. Before the installation we made a pact to nag each other unmercifully until



the fastening of the seat-belt became a painless habit.

It took about a month—maybe a bit more—but the habit formed and did become painless. It persists to this day, stronger than ever through

several years of reinforcement, to the point where I fasten the seat-belt to move the car across the street (or to a point where I have to make a conscious effort to override the habit—and suffer the resulting nagging discomfort). On the rare occasions when I'm sucked into riding with someone who doesn't have seat-belts (a vanishing breed, thank goodness) I'm nervous.

Some years later, I was happily engaged as an IP in the O-2A, flying twice a day and teaching big airplane drivers about little airplanes. My first mission on this particular day was a transition mission with a fairly new student, and one of the syllabus items was no-flap landings.

I demonstrated the first one; called for closed pattern, pulled up on downwind, talking a mile a minute over a hot mike trying to point out power settings, pattern placement, aircraft attitude—all the things that were different. Abeam our intended touchdown point I pulled the power to idle, still talking—then shut up and listened to the gear warning horn tell me what a jerk I was. Great blushing and reddening of face.

I made the best of it. Put the gear down, continued the approach and landing and made a pitch to the tune of "See? It can happen to anyone!"

But I didn't let it bother me for too long, dismissing it as a checklist inadequacy that didn't really have much practical application anyway; in this bird the checklist sequence goes flaps-gear. I didn't go flaps, so I didn't go gear.

I had about dismissed the incident from my mind by the time the second mission rolled around. Different mission, different student, same airplane. Approaching the traffic pattern after some airwork, I pulled the throttle back to check the warning horn . . . *and the horn didn't work!*

Well, that got my attention! It didn't take any great smarts to figure out that if that little item had decided to goof off about three hours earlier, it would have been the sickening screech of metal telling me what a jerk I was—followed



in rapid succession by a major, a lieutenant colonel, a colonel and maybe a brigadier general.

After mulling over the problem for awhile, I decided that a deeply ingrained habit pattern was the best answer—just like the seat-belts in the Chevvy. For the next month or so I made a diligent effort to nag at myself about landing configuration. I chose two points: abeam the departure end of the runway on downwind and on short final approach.

(These two points don't apply to all aircraft, of course. I chose them because they were particularly well suited to the O-2 and the way we flew it.)

And it worked! After a month or so, I couldn't pass the departure end of the runway or the approximate mid-point of final approach without getting fidgety—and the only way I could relieve the fidgets was to make a conscious and *positive* gear check. (In the case of the O-2, a green light, handle in the



down neutral position and a visual check of the gear itself.)

As a result, I ended up with what I think is a heck of an asset; I get some free insurance against a red face and writer's cramp from the paperwork (and, maybe, in some other type of bird, something a lot worse). It requires no conscious effort, I didn't have to work very hard to acquire it, and I feel a whole lot more comfortable in a traffic pattern.

So I recommend it just like I got it—free. Pick yourself a couple of memory crutches and nag yourself for a month or so. It might turn out to be the best investment you could make. ★

PILOT'S QUIZ



1. You arrive over the station (VOR or ADF) for a teardrop penetration and are below the published IAF altitude; you should

A. Begin an immediate penetration but do not descend below procedure turn altitude until established inbound.

B. Maintain the outbound published course and establish a slow rate of descent to compensate.

C. Use any method as long as you do not descend below penetration turn altitude.

D. Maintain altitude and proceed outbound 15 seconds for each thousand feet below published IAF altitude before beginning descent.

2. If a penetration turn altitude is depicted, do not descend below this altitude until you are within, and will remain within, 10 degrees of the inbound course.

A. True
B. False

3. Air Force pilots should disregard the inbound and outbound 45 degree off course bearings depicted on the head of the barb symbol used on the procedure turn plan view (⟍⟶) on the approach plate.

A. True
B. False

4. On a VOR approach with radar monitor you will receive (from radar)

A. Traffic advisory
B. Course information
C. Glide path information
D. Missed approach point (MAP) information
E. All of the above.

5. On a PAR, decision height can be determined by either the cockpit altimeter or when advised by final controller, whichever occurs first.

A. True
B. False

6. Execute a missed approach when

A. At DH and you cannot see the runway environment clearly enough to land

B. A safe landing is not possible

C. When directed to do so by the controller

D. All of the above.

7. At three miles on ILS final the glide slope indicator is displaced one dot; you are

A. 55 ft.
B. 78 ft.
C. 110 ft.
D. 200 ft.

from being exactly on the glide slope.

8. As a rule of thumb you should not make a ground speed check on TACAN closer than 20 NM to the station.

A. True
B. False

9. You are being radar vectored to an ILS approach and the controller tells you "cleared ILS approach."

A. You are cleared to descend to the glide path interception altitude at that time.

B. You are cleared to descend to the glide path interception altitude when the CDI moves away from fully deflected.

C. You are cleared to descend to the glide path interception altitude when the CDI is "captured," i.e., when it is within one dot of centered.

D. You must intercept the glide path from your last assigned altitude and execute the published approach.

10. When executing a low altitude procedure turn you should start initial descent from procedure turn altitude when

A. You are within 10 degrees of the procedure turn course and on an inbound intercept heading.

B. You are within 20 degrees of the procedure turn course and on an inbound intercept heading.

C. The aircraft is outbound in relation to the published procedure turn course.

D. Your heading is within 10 degrees of the procedure turn course.

ANSWERS

1. D (AFM 51-37, p. 15-7)
2. B (AFM 51-37, p. 15-7)
3. A (AFM 51-37, p. 15-13)
4. A (Airman's Information Manual, p. 1-64)
5. A (AFM 51-37, p. 16-7)
6. D (AFM 51-37, p. 16-7)
7. B (AFM 51-37, p. 17-8)
8. B (AFM 51-37, p. 12-9)
9. A (AFM 51-37, p. 17-7)
10. A (AFM 51-37, p. 15-14) ★

MISUSE OF OXYGEN SYSTEMS

Lt Col RONALD J. D'AIUTO, Directorate of Aerospace Safety

A few months ago a sister service lost an aircraft when the pilot disconnected his oxygen mask for some reason and lost consciousness. Two Air Force interceptors flew on the wing of the stricken aircraft at 33,000 feet for ten minutes trying to arouse the pilot or turn the aircraft. All efforts were unsuccessful as the autopilot held the aircraft on its altitude and heading. The aircraft subsequently crashed at sea.

In January 1972, the pilot of an Air Force jet fighter took off with his oxygen mask disconnected and climbed to altitude. At 18,000 feet, when the pilot connected his mask, he found the oxygen system was depleted. In spite of this, he elected to press on since the cabin pressurization functioned properly and flight at *high altitude* was planned to be brief. These plans soon went awry. To accomplish the mission he loitered at high altitude (above 30,000 feet), became hypoxic, extremely disoriented, and nearly crashed.

The major commander concerned summed up Air Force policy on the use of oxygen when he sent the following message to his commanders:

"AFM 60-16 requires that the quantity of oxygen aboard an aircraft before takeoff be sufficient to accomplish the planned mission. It also requires use of oxygen if the cockpit altitude exceeds 10,000 feet. In addition, this command . . . requires aircrews of ejection seat equipped aircraft to have oxygen masks secured prior to takeoff and during all flight operations. The incident . . . could easily have cost a pilot and an aircraft. While I can appreciate the candidness of the pilot in relating his experience so that others might learn, I cannot allow the continuance of such actions. That a pilot would press on to higher altitude without oxygen is inconceivable to me. It is equally difficult to understand why pilots fly without their oxygen masks hooked up, although I have been informed that this is not an uncommon practice.

"I require that each commander make known to all aircrew members my position on this matter. The deliberate violation of flying directives, serious breach of flight safety principles, or inability to exercise the ordinary common sense expected of any military pilot cannot and will not be condoned." ★



GROW OLD ALONG WITH ME

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The author, now a professor at Southern Illinois University, served as a Naval pilot from 1941 to 1945 and as a Naval Reserve pilot from 1949 to 1957. He had extensive experience in the F-4F, F-6F and F-4U. Although the article was written several years ago, shortly after the author concluded his military flying career, the wisdom it contains has stood the test of time and is as pertinent today as the day it was written.

Recently I took what I am sure was my last flight as a pilot of a military aircraft. I was a member of an outfit which was eliminated in the defense expenditure cutback, and I have ranked and aged myself out of active reserve duty. I would be less than human if I did not, at this time, look back on my years of flying and try to evaluate the factors which operated to keep me alive, as well as those mistakes which might have killed me.

I felt a resurgence of the impulse to buttonhole young men and women just beginning, whether in private or military flying, and say the magic words which will keep their bones intact and send them home each evening, a joy to spouse and children.

I can say what I have to say without pride or arrogance, because I was a mediocre pilot. I learned slowly; I was not by any stretch of the imagination a "natural." My awareness of my limitations, I am sure, is one important factor to which I owe my life.

I did not have the skill to toy with chance and stretch my craftsmanship beyond its capabilities. I would not slow-roll at less than 5000 feet, because I scooped out at least half the time; nor would I practice spins unless I had so much altitude that the ground seemed as remote as the moon.

There are two kinds of pilots who get hurt: clever ones and poor ones. The clever ones gradually acquire a confidence which may mislead them, and tempt them to cross the safety margin once too often; the poor ones are merely incapable. But there is one common attribute which both types possess: they lack imagination. Their thinking is narrow; they fail to consider the possible consequences of a breach of flight discipline, a disregard for regulations, or an overextension of their abilities.

They assume that **all** conditions at **all** times will be normal. They assume that the ground is flat without obstructions, that the old altimeter setting is good enough, that there is no other plane in the air, that the weather will hold, that the obsolete chart is reasonably accurate, that the fuel tank was topped, that the field is open, that the mags will clear in the air, and that the runway is long enough despite the temperature.

These are foolhardy assumptions, resulting from laziness and wishful thinking. If there is one thing we can be sure of in this journey through the cosmos on this thin-skinned pea of an earth, it is that change is constant; nothing is ever the same.

It is apparent to me that the human race is invincible. You need only consider the fact that a man who knows he has only one life to live will offer it to eternity because he is too lazy, or too unimaginative, to take an extra minute to ask a mech how much oil was put in. This brand of courage exceeds that of the tiger.

I distilled a single rule from the potpourri of experience, a rule which contains just about all there is to flight safety. It is, however, a mere phrase, unless we extend it through every flight activity. It is simply:

NEVER TAKE ANYTHING FOR GRANTED.

There are plenty of things which we are forced to take for granted without adding to the list. We must accept the evidence of our eyes and nose that the liquid in the tank is aviation gas or JP, that the length of the runway is 8000 feet if En-route-Supplement says it is, and that the fuel control will compensate for changes in altitude. We lean heavily on properly trained authorities for vital information, and if they fail us we cannot help it.

But there are those factors which can be checked personally, which should *never* be taken for granted. I learned one lesson fairly early, and the nearness with which I came to killing, not only myself, but another pilot, had an extremely sobering effect.

I was lined up on the runway's centerline with a student under the hood in the rear cockpit, preparing for an instrument takeoff. Another plane was lined up ahead for the same purpose. My student was on the brakes, ready for full throttle when I gave the order. While I could not see over the nose of my plane, I did observe the wings of the first plane recede and disappear as it started down the runway. After a decent interval I told the student to roll, and I stayed on the interphone to advise and correct him. He did so, and a few seconds later my guardian angel stepped in.

"Now look, buttonhead," he said to me, "the first plane started rolling, and you figure that he is airborne at the end of the runway by now. But you don't see it. You're just taking it for granted."

I took control, hit the brakes, and throttled back. My aircraft stopped 20 feet short of the No. 1 plane, which had aborted, probably because the student was veering off heading. I would unquestionably have chewed through at least one cockpit if I had continued.

I owe to a certain vice of mine a good bit of the credit for the fact that my wife was cheated out of $10,000 of government insurance: I am an experience thief. I steal the experience of others.

Your own experience is the worst possible teacher, despite the famous dictum. It is much too expensive. I enjoy the nasty habit of appropriating that of other pilots.

Every time I read or heard of an accident I would ask myself: "Do I fly in such a way that it could have happened to me?" If the answer was yes, I did my best to correct my habits. Like a parasite, I stayed alive on the flesh and blood of others, and I admit it without shame.

I love the taste of hamburgers with catsup and onions, and I love my wife's embrace in front of the fireplace on a fall evening. My imagination is a vivid one, and when I fail to see the other plane in the traffic pattern when tower informs me it is there, I panic.

No more hamburgers? No more kisses? The cold sweat breaks out, the head is swiveling like a Grimes light. No more baseball with my boys? The heart beats faster. The blood pressure rises. No more cans of beer on a hot afternoon? The breath comes short and hot.

Where in hell is that other plane?

I bank right and left to find it. I drop first the right wing, then the left.

Tower: "Nine zero four, are you having difficulty?"

Oh, no. How can the thought of a midair collision at 1000 feet suggest difficulty?

I make my voice calm. Nobody must know that I am afraid of a midair collision. After all, am I not a pilot?

"Tower from 904. Don't have the other aircraft. What's his posit?"

Tower: "He's on short final. You're No. 1."

"And how did it go today?" Cindy asks as I pick a cold beer out of the six-pak.

"Very nice," I answer. "Do you think it's chilly enough to light the fire?"

I knew two pilots whose tragic exits I was able to predict. One was a clever man, with an enviable skill and a superb practical and theoretical knowledge of aerodynamics. The other was a wise guy.



I loved Casey, the first one, like a brother. He taught me much about flying, and he was, for me, St. Exupery and Jimmy Doolittle rolled into one. But he couldn't subtract. He didn't know when his units of safety were reduced to a dangerous minimum. His skill was his murderer.

He could roll at 200 feet and never scoop out. His aircraft was as his own body. This is a fine thing, but there are possibilities over which your skill has no control. Engine failure is one of these, and engine failure when inverted at 200 feet is a troublesome event. A parachute is useless, and your choice of pasture is severely limited, even if you complete your roll. Casey did not complete his. He scattered gas, guts, and gaskets over 500 feet of ripening corn.

I was such a mediocre pilot that I never had the courage to attempt such intrepid maneuvers. I mourned the death of Casey, but my grief didn't help him. He has been long gone, and I am here tonight, as I write, watching the scarlet leaves of the maple drift by my window in the moonlight. And yet his craftsmanship far exceeded mine.

Marvell said it 300 years ago:

"The grave's a fine and private place,
But none, I think, do there embrace."

But I love to stunt. You should see my triple sequence: the split-S, loop, and Immelman, coming right out on the original heading. I start it at 10,000 feet. I'm very proud of it.

The other pilot I shall call Grant. He was a likeable youth, but he lacked humility. He wore his cap on the side of his head, and made wrapped-up turns to a landing. He would argue areodynamics with pilots who had more hours of night flying than he had altogether. Can you imagine yourself advising Saint Ex on the best route to Dakar? Grant could have done it.

One day I said to him, after a particularly disheartening discussion (I think he was insisting that a plane in the air would weathercock): "Grant, it matters not to me whether I win the argument, but if you fly like you talk, you're gonna kill yourself."

He snorted, retilted his cap to a more rakish angle, and stalked off whistling, "Off we go, ta-ta-ta-tum-tum-tum-tum."

I had no car in those days, so Grant picked me up every morning to drive to work. One Monday morning, two weeks after my melancholy prediction, he failed to show, and I had to hitchhike. No bus.

The CO was on the phone when I loped in, an hour late. I was nervous and furious; we were flying a very tight schedule. I started blabbing when it was apparent that the CO was waiting for somebody at the other end.

"That damn Grant didn't pick me up this morning! It's not my fault!" I pounded on the desk.

The CO started talking on the phone, and being versatile like Caesar, wrote a note for me on the pad.



Grant was killed yesterday.

I had the psychic feeling of inevitability you sometimes get in a poker game when the card you draw is exactly what you expected. Of course, I said to myself. What else could it be?

He had his brother, a visiting cadet, in the rear seat when he pulled the wings off the trainer over Biscayne Bay. The only two boys in the family. What would his mother think, I wondered, and what could his father say?

I said before that Casey didn't know how to subtract. I referred to my formula for safety. According to my ingenious reckoning, safe flight is maintained only when you stay above a certain number of what I call safety units.

When you have trouble in an airplane, there are at best, a fairly large number of lifesaving alternatives. As far as I am concerned, there are more of them in the air than on the highway, where an oncoming car on your side of the road, passing on a curve, may reduce your alternatives to near zero. These units are your treasure, money in the bank, the buffers against chance, fate, bad weather, or even your own fallible judgment. . .

When the stories drift around to telling hairy tales of flight, don't feel put down just because your log book has a clean "Accident and Flight Rule Violation Record" page. Why, with a little imagination and the right superlatives, you can make a T-28 prop governor failure sound comparable to a double generator failure while IFR in a Phantom.

Best of all, feel within yourself the satisfaction of completing difficult and, quite often, dangerous flight missions in a cool, professional—and *safe* manner.

Now I am a private pilot only. I look forward to dancing the skies on "laughter-silvered wings," to winging to my destination in a safe, straight line, far above the twisting hazards of the increasingly expensive highways. There are no toll roads up there in the blue, no billboards, no speedtraps, no traffic lights. There is only the challenge to my imagination and to my common sense.

I must finish now. The ashes are glowing in the fireplace. Cindy has the coffee on, and I have marshmallows to toast. ★

(AIRFACTS Magazine)

FROM A CHIEF OF SAFETY

METRO van not chocked, not braked, engine running, unattended, pointed at and within ten feet of aircraft.

Speeding on flightline, around aircraft.

Driving between parked aircraft.

Powered AGE (internal combustion engines) positioned too close to aircraft.

Aircraft not chocked.

Night towing operation:
Rider on back of towing vehicle.
No wands in use.
No whistles.
Towing too fast.

Do these safety violations sound familiar? These discrepancies indicate that shift supervisors are not controlling their personnel or observing common safety practices.

Supervision exists at more than one level. Safety supervision is the responsibility of each individual at every level. Supervisors are not expected to look over the shoulders of their subordinates continuously; however, they should indoctrinate their personnel through lectures and periodic on-the-job spot checks.

The supervisor is the key to an effective safety program and his attitude greatly affects the attitude and performance of subordinates. Gross violations such as those listed above in the name of "getting the job done" are unacceptable. When the supervisor is so negligent as to allow these practices, he demonstrates his lack of a sense of responsibility. If unsafe practices are condoned by supervisors, these practices will become the rule rather than the exception for the subordinates.

Supervisors must enforce good safety practices and must make a concerted effort to correct unsafe acts when they are observed. In the future, it will be the policy of my staff to annotate on the appropriate form any supervisory involvement in noted safety deficiencies. This practice is designed to educate supervisors in their responsibilities toward their personnel.

ED. NOTE: *Some findings from an active safety officer.* ★



RAMP ACCIDENTS



a pressure play

In the early days, if a mishap occurred during the ground movement or aircraft, it was seldom a big thing. The squadron airframe specialist spent a few hours with dope and linen, and the bird was as good as new.

Those days are gone forever!

The accident potential associated with ground movement of aircraft has increased tremendously. Some modern aircraft cost more, *per unit*, than the entire defense budget in olden days. Some modern aircraft contain enough fuel to have run an old-time squadron through an extended campaign. Many modern aircraft are frequently loaded with ordnance more volatile and destructive than our forebears dreamed of. And, with gross weights approaching the 400 ton mark, none of us can take ground movement for granted.

As a result, the movement of aircraft on the ground is covered by extensive and specific directives, which have been developed through years of experience. Because they are based on experience, they are sound, workable and so thorough that all we have to do to assure doing our job correctly is follow them.

In spite of this, deviations occur. We let the pressures of combat, quick turn-arounds or immediate launch lead us astray. When hard pressed for time, we use the pressure to justify shortcuts. We seem to feel that if we follow the directives, we waste valuable time.

We are wrong.

Consider the crew chief whose F-4 had just taxied in. The bird had to be turned around and backed into the revetment. The crew chief *knew* he didn't have enough help to do it safely, but since it was a quick turnaround, he went ahead and moved it. As the aircraft turned, the slab struck a power unit. *This aircraft missed several sorties because the crew chief deviated from established procedures to save a little time.*

Another case involved a B-52, which taxied in after a mission and was spotted in front of revetment one. The intention was to back it into revetment two. The B-52 in revetment one started its engines, preparing to launch, and the tow equipment hadn't arrived. The first bird had to be moved ASAP!

The pressure caused the crew to throw their judgment away. Every single man involved knew the correct procedures, but the strain of the moment won over.

Since the taxiway was sloped, they decided to free-roll the bomber backwards to clear revetment one. One man got on the brakes, the chocks were pulled, and the aircraft was allowed to roll back about ten feet before it was stopped. That wasn't enough, so brakes were released and the bird rolled back another ten feet—and was stopped. The launching B-52 still couldn't get out, so brakes were released a third time, the plane rolled back—but this time it didn't stop, because the accumulator pressure had been depleted!

As the airplane gained speed, one of the ground crewmen threw a chock in the path of the left forward truck. The chock didn't stop the airplane, but did deflect the front trucks, steering the airplane down a steeper incline and into a third B-52.

Estimated manhours to repair: 12,000.

Let's look at the pattern:

- Pressure is on.
- The ground crew takes a shortcut—even though they know better.
- The result is exactly the opposite of what they were trying to achieve.

Why is it that, while there is never enough time to do it right, there's plenty of time to pick up the pieces and start all over?

DO IT RIGHT THE FIRST TIME! ★

REX RILEY'S CROSS COUNTRY NOTES

876-2633 AUTOVON

Critical: Here is a rather critical item that all transient types should be familiar with. As you know, LOGAIR birds do a lot of hauling for Uncle Sam and much of it is in the Lockheed Electra. Just recently I found out that cranking this bird is a lot different from most airplanes. Here's a quote that will help explain two problem areas. One is associated with high pressure air, the other with a potential electrical shock.

"Let me tell you about the Lockheed Electra; it requires high-pressure air from an air start unit to start the Nr 4 engine. If certain valves in the system should stick, it could cause one or more of the engines to start without the pilot's knowledge or control—a most dangerous situation—so the air start unit should never be plugged in and turned on without a signal from the pilot. Unfortunately this happens all the time—alert personnel turn it on whenever they feel like it, not realizing the hazard.

"On each Electra there is a power receptacle on the right side of the nose which contains an amber light to indicate that the aircraft is receiving power from the ground unit; printed directly above it in large red letters is the warning:

DANGER: UNDER NO CIRCUMSTANCES MUST THE EXTERNAL POWER PLUG BE REMOVED WHILE THE AMBER LIGHT IS ILLUMINATED. FAILURE TO COMPLY COULD BE LETHAL.

"So when you pull the plug without a signal—scary."

We have already wrapped an airhose around the prop and if everybody doesn't get this word, we're going to have somebody's hair parted with one of those paddles.

Surprises, or as the cool cats say "unplanned events" are something that we could well do without in the cockpit. Some of these surprises come in the form of unusual clearances. I'm well aware that some situations dictate complicated departures but when you have your handy-dandy SID right in front of you and you are directed to proceed to a fix that almost nobody has heard of, it tends to get your flight off to somewhat of a bad start. In some cases its very possible that a fighter could be given directions to a low altitude fix that isn't depicted on the charts he has. If that happens, at the very least he is going to have a delay and a cluttered frequency, while the tower has to go through the complete explanation of how to fly this new departure. There is usually a way around this type of thing. To insure that surprises such as these are kept to a minimum, the guy from Ops must get together with the people who are responsible for clearances and iron out the problem. It just may be that Center doesn't know a problem exists.

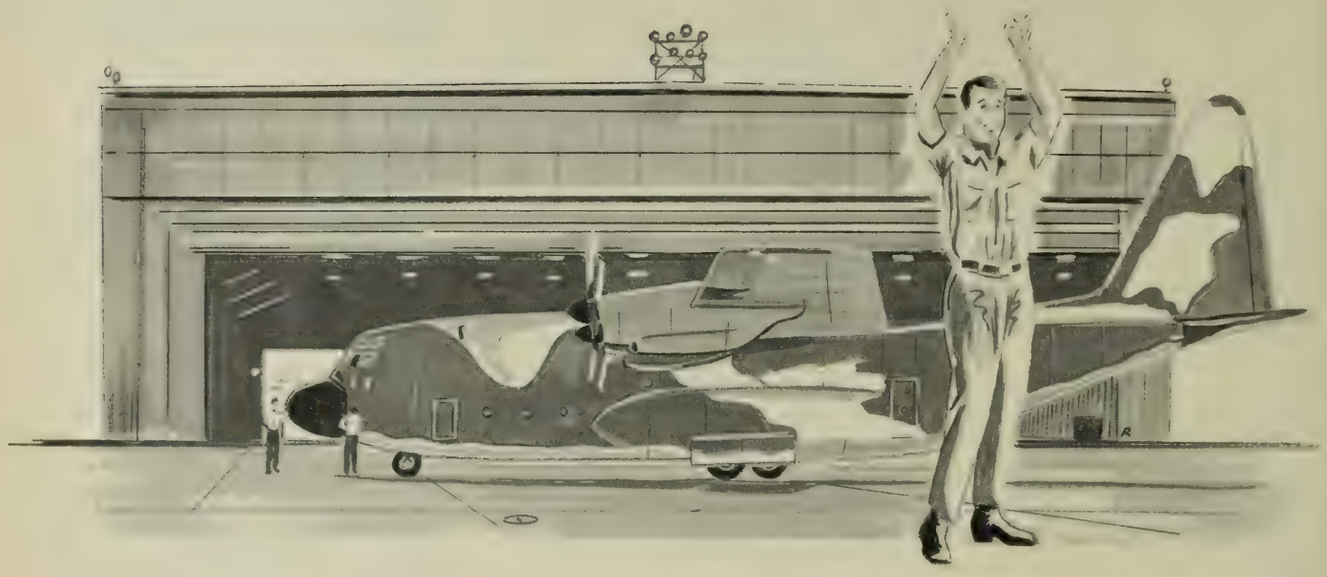
Patches: We recently forwarded a suggestion from one of our transient types who suggested that we design a patch to be worn by those transient sections that have been selected for the Rex award. We thought it was a good idea. If it is approved you should see it in the field before too long. ★



REX RILEY

Transient Services Award

LORING AFB	Limestone, Me.
McCLELLAN AFB	Sacramento, Calif.
MAXWELL AFB	Montgomery, Ala.
HAMILTON AFB	Ignacio, Calif.
SCOTT AFB	Belleville, Ill.
RAMEY AFB	Puerto Rico
McCHORD AFB	Tacoma, Wash.
MYRTLE BEACH AFB	Myrtle Beach, S.C.
EGLIN AFB	Valparaiso, Fla.
FORBES AFB	Topeka, Kans.
MATHER AFB	Sacramento, Calif.
LAJES FIELD	Azores
SHEPPARD AFB	Wichita Falls, Tex.
MARCH AFB	Riverside, Calif.
GRISSOM AFB	Peru, Ind.
CANNON AFB	Clovis, N.M.
LUKE AFB	Phoenix, Ariz.
RANDOLPH AFB	San Antonio, Tex.
ROBINS AFB	Warner Robins, Ga.
TINKER AFB	Oklahoma City, Okla.
HILL AFB	Ogden, Utah
YOKOTA AB	Japan
SEYMOUR JOHNSON AFB	Goldsboro, N.C.
ENGLAND AFB	Alexandria, La.
KADENA AB	Okinawa
ELMENDORF AFB	Alaska
PETERSON FIELD	Colorado Springs, Colo
RAMSTEIN AB	Germany
SHAW AFB	Sumter, S.C.
LITTLE ROCK AFB	Jacksonville, Ark.
TORREJON AB	Spain
TYNDALL AFB	Panama City, Fla.
OFFUTT AFB	Omaha, Nebr.
McCONNELL AFB	Wichita, Kans.
NORTON AFB	San Bernardino, Calif.
BARKSDALE AFB	Shreveport, La.
KIRTLAND AFB	Albuquerque, N.M.
BUCKLEY ANG BASE	Aurora, Colo.
RICHARDS-GEBAUR AFB	Grandview, Mo.
RAF MILDENHALL	U.K.



Many aircrew members and receiving organizations have been known to register anything from silent disappointment to utter disgust toward Air Force Logistics Command (AFLC), the Air Materiel Area (AMA) or the contracting facility when aircraft are picked up or received from Inspection and Repair as Necessary (IRAN). So, an education program for many Air Force people outside of AFLC (and maybe some within) may, at least, smooth relations.

Times have changed. Perhaps the term IRAN is long outdated and should no longer be used. Too many people still expect that IRANing an aircraft will, or should, result in everything being inspected and repaired so that a perfect, 100 percent operational bird is picked up or comes back. It would be nice, but "tain't so!" Popularizing or officializing a term such as IRAP, Inspection and Repair as *Programmed*, would probably be in the best interest of the system and everybody involved.

The following dissertation on the subject recently came to my attention. I think it should be publicized world-wide so everyone knows "the name of the game." The author is unknown, but he deserves credit for getting the words on paper.

The aircraft rolls to a stop, back from 10 weeks at a modification site. The folks bear down on the scene.

After the greeting, a barrage of comments, some inquisitive and some unprintable, rises from the group of wrench-benders. On the surface they all appear to be justified.

"We sent that aircraft to the depot to be refurbished, but it looks like it's aged a thousand hours," roars the boss of maintenance. "We've been had. Hardly anything has been restored to a new-like condition. They didn't even paint this crummy floor."

The fact that there were a few new modifications halfway simmers him down, then the crew chief reports 58 open discrepancies in the aircraft forms; new and quite detailed.

This really glues the chief to the ceiling. He feels the whole depot system is badly bent out of shape. The last few aircraft returned from the mod site looked worse to him than some of the war machines he had ferried to the pickling bases.

At this point, let us invite the cussed and the discussed to shake hands, regroup, and examine a few hard facts. Granted, we would all like to be the recipients of "new" aircraft out of the mod barns, BUT, even though the game is the same, the rules have changed.

Some of the changes have come from the Department of Defense; others from major command and depot system management. All of them have been prompted by the ever-present trend to squeeze from the defense dollar one dollar of defense.

Maintenance at a mod site, be it Air Force depot or contract facility, has been tailored to the installation of a maximum amount of mission-oriented hardware in a given amount of time. If not understood, the result of this concept can be earth-shattering. Here are the cold, hard facts:

There have always been two types of weapon systems input to a mod site. First is the bird in which neither the ferry crew nor the receiving inspectors report any critical

IRAN versus IRAP

GEORGE E. KAMMERER, SMAMA, McClellan AFB, California

problem areas. Discrepant items are minor, systems are serviceable.

The second type is the machine that may arrive with a variety of power plants burning, as well as churning, on final approach. The receiving inspection quickly determines that it has been carefully "prepared" for the depot maintenance cycle. Equipment racks are full of inoperative and/or obsolete black boxes. White elephant hardware has been modified to "fit" for the ferry flight. Big red tags are hanging from system switches, and the flight report reads like a Mil Spec requirement, or else it candidly goes like "one-time flight O.K."

In earlier times the IRAN program would receive both types and crank them out at the other end as serviceable all along the line. Not so today. The IRAN concept was simply too costly in time and funds when applied to massive, sophisticated weapon systems. It has been replaced by a concept of clearly defined modification programs. Lacking a handle, let's call it IRAP—Inspection and Repair as Programmed.

Common aspects of these programs are: (1) They have been initially programmed to accommodate a known work package; (2) Items over and above the work package will be corrected only when considered safety of flight items or are necessary for a one-time flight home; (3) "Gold Plating" on design of new systems has given way to a concept of systems "active value"; (4) Wherever and whenever possible, field maintenance will be kept in the field; (5) Greater emphasis on system serviceability, not necessarily "like new"; (6) Competition among the mod sites to do the best job in the least time and at the most economical price.

What does this mean to the user? What condition will a weapon system really be in when received from a mod site? Assume that an aircraft is turned into a depot for an engine and autopilot modification. The depot will examine and classify all recorded discrepancies. Those related to safety of flight, plus those associated with the modification work package (engine and autopilot in this case), will be worked on and checked for serviceability both in flight and on the ground.

All other discrepancies, except those affecting the minimum requirements for the one-time return flight, will *not* be corrected. Inoperative or obsolete black boxes will go back the same way they came in. Ditto for homemade hardware. Test flights will be made only to determine serviceability of the modified or newly installed systems. An O.K. flight will mean only those systems were air checked and found to be serviceable.

This is today's "minimum maintenance" concept, and a crystal-clear understanding of the whole picture is mandatory for all maintenance troops, supervisors, aircrews, and commanders. It should also be noted that for a base to get back the same tail number from a mod site "ain't necessarily so." The using command aircraft distribution officer may, and often does, redistribute his aircraft to meet his operational requirements.

IRAP has proved successful in saving a lot of our hard-earned tax dollars. It will be even more successful when all of us, airborne, or groundborne, functional or logistical, get behind it and push. ★

Ops topics

BUCKLE HUP!

Two passengers were seriously injured recently when the C-130 in which they were riding encountered clear air turbulence in an area of thunderstorm activity. One passenger was asleep when the pilot directed "fasten seat belts," and never got his fastened. The other passenger said he had his belt secured, but there was no sign of belt failure and, when asked to demonstrate the fastening of the belt, the passenger was confused about its operation.

Without trying to cast blame on anyone, perhaps there are some things we can do to improve passenger safety.

- The initial passenger briefing should include instruction on how to fasten the belts and advice to keep the belt fastened at all times, when seated, regardless of whether the "fasten seat belt" sign is on or off.

- Loadmasters should examine each passenger to make certain the belt is fastened once the light comes on, or at the pilot's command.

NOTE

(CHINA, BURMA, INDIA)
HUMP PILOTS ASSN.
27TH ANNUAL REUNION
RIVIERA HOTEL &
COUNTRY CLUB
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AUGUST 17, 18, 19, 20, 1972

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The Port Authority of N.Y. and N.J.
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New York, N.Y. 10011
Telephone: (212) 620-8396

T-29 FUEL STARVATION

The T-29 pilot set up a long final, established a wing-down, no-crab configuration about three miles out, and drove in toward the runway. Crosswind component exceeded 20 knots from the right. Power was set at 2800 rpm with about 30 inches MAP on Nr 1 and 40-45 inches MAP on Nr 2. On short final, Nr 2 engine quit running from fuel starvation, even though there were 900 pounds of fuel in the right tank.

Thorough checks of the engine and the fuel system disclosed no defects, so the organization decided to perform some tests under controlled conditions at altitude. Two T-29 aircraft were used for the tests, and both flights confirmed that engine failure will occur during a wing-low, cross-control configuration with a fuel load of 900 pounds in low wing tanks!

On the first test, with 20 degrees of bank and a combination of differential power and top rudder to maintain heading, the low engine quit after approximately one minute. Fuel load was 900 pounds per wing.

On the second aircraft tested, four combinations of cross-control were used. With 25 degrees of bank the engine quit after one minute—with ADI either off or on. Fuel in the low wing at completion of the fourth combination was 825 pounds.

Changes are in the mill to get the word out to everyone concerned. In the meantime, T-29 and C-131 operators should be aware that an extended cross control condition may result in an inadvertent single engine approach.

(NOTE: Interim Safety Supplements for T-29 and C-131 aircraft were transmitted on 22 March, and provide important information concerning the fuel systems and crosswind landing techniques. Refer to SAAMA message Nr 221966ZMar72.)

DING!

The C-130 pulled out of its parking spot and taxied along the yellow line between the rows of parked C-130s. After it had taxied approximately 500 feet down the taxiway centerline, the left wing tip collided with the trailing edge of the tailcone of another C-130. The flight engineer informed the IP of the collision, and the IP stopped the aircraft and shut down all engines.

How could that happen? Let's take a look, but first let's get some numbers in mind. The parking area was designed for C-130s. Wingtip clearance between properly parked aircraft is 20 feet. C-130s taxiing between rows are provided wingtip clearance of 26 feet. With those figures in mind, we can now analyze the *process* of a taxi mishap.

C-130 Nr 1 arrived late in the afternoon and was parked by transient alert. TA didn't do too sterling a job, and the bird was parked 14 feet aft and 12 feet left of its proper spot.

C-130 Nr 2, which had previously been assigned the spot to the left of C-130 Nr 1, had been out flying. It got back after dark and taxied in to park. Since Nr 2 wasn't considered a transient (having arrived previously and assigned a parking spot), TA assistance wasn't provided. The airplane was parked using the flight engineer as marshaller and the loadmasters as wingwalkers.

Nr 2's pilot couldn't see the guideline or nosewheel spot because of light reflecting on the wet ramp, and he misaligned the aircraft five feet to the right of the guideline. The flight engineer stopped him when it became obvious that inadequate wingtip clearance was available between the two aircraft. The pilot called ALCE and advised that he was unable to taxi all the way into the parking spot. ALCE instructed him to shut down in place, and advised that they would check the aircraft later. Nr 2's position was 5 feet right and 26 feet aft of its parking spot.

The basic ingredients are all in the pot. That 26-foot clearance provided by the yellow taxi line is all used up.

Fourteen hours later, in broad daylight, C-130 Nr 3 pulled out of its parking spot and headed for its unplanned meeting with C-130 Nr 2.

The IP on Nr 3 bought the mishap, of course. But he had a lot of help.

That kind of help we don't need.

FLIP CHANGES

Some transponders are equipped with a Mode C automatic altitude reporting capability. This system converts aircraft altitude in one hundred foot increments to coded digital information which is transmitted together with Mode C framing pulses to the interrogating radar facility. Aircraft equipped with transponders that have altitude reporting capability will activate this Mode in areas under FAA jurisdiction, unless otherwise directed by ATC or unless equipment error has been reported to be in excess of 125 feet.

PREVENTABLE FOD

On postflight inspection, the F-4's left engine was found to have incurred foreign object damage. Investigation disclosed that the damage to the engine had been caused by a bolt from a DART tailcone assembly. Markings on the damaged engine matched up with the suspect bolt.

As it turned out, about 20 minutes before the incident aircraft took off, a tow aircraft had inadvertently dragged a DART on takeoff. But here's the kicker: The RSO saw the DART being dragged—but didn't bother to request a runway inspection.

Estimated manhours to repair—600. Estimated cost —$20,000.

BIRDPROOF?

A T-38 recently came away a poor first in an altercation with a Franklin's Gull. Max gross on the bird is one and a quarter pounds, but it knocked a five-by-seven inch triangle out of the birdproof windscreen.

An EUMR has been submitted on the windscreen.

Keep those visors down, folks!

Ops topics

CONTINUED

TAIL ROTOR BLUES

Partial control failure is an emergency anytime. It's a pleasure to report on how analysis and careful planning, coupled with pilot skill, resolved one emergency.

The UH-1P had just leveled off. As climb power was reduced to cruise power, a left yaw developed, and the pilot discovered that the aircraft didn't respond to rotor pedal movement. The rotor pedals could be moved full travel in either direction without corresponding change in the aircraft direction. Any reduction in power aggravated the left yaw condition. For this reason, the pilot chose to make a left-hand pattern to landing. The landing site selected was into the wind on a grassy area.

After analyzing control response and severity of yaw at various power/airspeed combinations, the pilot decided to try a slide-on landing at a power setting/airspeed which would minimize the yaw.

He first tried a normal approach at 50 knots, but the yaw which developed when he reduced power to descend from normal pattern altitude was excessive. It didn't look right, so he took it around!

On the second approach, the pilot lost most of his altitude in the turn to final, and rolled out on a long, flat approach which required higher than normal power —and which minimized the left yaw. The power required for a 30 knot approach held the glide path and permitted straight flight.

The pilot maintained his power setting, held 30 knots airspeed, and flew the helicopter to the ground using a combination of brief forward cyclic control movements and short movements of the collective control. At touchdown, he firmly lowered the collective and the helicopter slid to a stop.

Landing slide, about 20 feet. No damage. No injuries. Nice job!

HAIRCUT-ARMY STYLE

The C-130 crew had loaded paratroopers and was starting engines. Nr 3 and Nr 4 engines had been started and were on speed.

Just as the loadmaster cleared Nr 2, one of the paratroopers jumped out of the forward entrance door and ran through the Nr 2 prop arc to the rear of the aircraft, where he re-entered through the paratroop door. The loadmaster yelled "Stop! Hold it!" and the pilot pulled the start button out and pulled the condition lever to ground stop before the prop started turning.

Only a couple of seconds separated this incident from a fatal accident. The paratrooper could just as easily have popped out a few seconds later, when the Nr 2 engine would have been on speed.

The unit involved has developed a procedure of positioning a crewmember so as to prevent anyone exiting the aircraft without clearance. Unit crews have been told to emphasize in their briefings that passengers must remain seated until cleared to exit the aircraft.

This problem has been with us for years and it seems that people would finally learn. But they don't! So it's up to units and crews to protect personnel like this paratrooper from themselves.

ETERNAL OPTIMIST AWARD-1972

The most promising candidate for ASM's Eternal Optimist Award thus far for 1972 is the Flying Safety Officer who, in his initial message concerning an aircraft which was ditched offshore, classed the damage as "minor . . . pending recovery of aircraft." ★

EXPLOSIVES SAFETY

ASKING FOR TROUBLE

It's said that nothing is inevitable except death and taxes. If you're outside the United States and are returning, another inevitable fact is a thorough Customs inspection.

It may be that a tougher Customs inspection is being conducted because of the increase of bombings and other illegal acts. Maybe they're looking for drugs, or other contraband. Whatever the reason, they're really going to shake you down.

Apparently, some people are unaware of the seriousness of smuggling explosives into the United States. Our reason for thinking this is the number of reports we receive where explosives have been abandoned in trash cans, rest-rooms, and so forth, before the inspection takes place.

Some don't get the word even then. They found one man with signal flares in his luggage. His excuse? He intended to use them in a Fourth of July celebration at home! Another case involved two MK-1 MOD 1 illuminating grenades that were found on a passenger.

A recent "find" was about one and one-half pounds of Comp C (a plastic explosive) that someone had taken great pains to bring back. It was separated into three packets, each wrapped in masking tape in a compartment belt. Apparently, whoever brought it back wore it around his waist until he felt he might get caught in Customs. He abandoned it prior to inspection.

The facts are you will probably be caught if you attempt to smuggle explosives. Why take it in the first place if you're going to have to abandon it before Customs inspection? As a taxpayer you paid to have it shipped over for a specific purpose. You're wasting your own money when you attempt to bring it home. Secondly, you could find yourself in jail. Further you, someone in your family, or some innocent individuals could be killed or seriously injured.

The possible consequences of carrying explosives aboard passenger-carrying aircraft are extremely serious. Continuing education by supervisors is essential, along with the exercise of common sense on the part of anyone contemplating such an action.

The best advice we can offer is: LEAVE IT WHERE YOU FOUND IT. If you ignore this advice, and later decide to abandon the explosives, use the amnesty boxes provided in or around your terminal buildings before boarding your flight home.

(Hqs 13th Air Force)

GORDON S. TAYLOR
Directorate of Aerospace Safety

BDU BDU BDU BDU BDU

Bomb Detonated Unintentionally, Brutal Danger Unforeseen, Badly Disfigured User Because Daredevil Underestimated Bombs Dangerous Untrustworthiness.

The cardinal principle in advertising is to repeat the key name again and again, until it is indelibly imprinted in the viewer's mind. Maybe this advertising principle is worth trying when it comes to associating the hazards of BDU-33 Practice Bombs on the minds of the handlers. It has happened again. A routine job of assembling a few signal cartridges in the day's requirement for practice bomb missions has once again had tragic consequences.

BDU normally stands for simulated bombs of a miscellaneous nature, or more commonly a Bomb, Dummy, Unit. The only "dummy" involved during or after mating with the signal cartridge is the individual who displays disrespect during handling of the bombs. The almost stereotyped accident report indicated Primary Cause—Personnel Error, in that force was applied to install the inertia tube and signal cartridge. Result was amputation of second and third fingers on the right hand, with approximately four weeks hospitalization.

Handling of practice bombs continues to cause accidents. Yet personnel can be seen assembling and handling them as though they were firewood, and often carrying loaded bombs two at a time, nose down, by the tail fin. Don't become the next **B**loody **D**arned **U**nfortunate victim. Examine your procedures, don't use force, keep bombs horizontal during loading and handling, and above all, stay away from the blast area immediately in front of or in back of the bomb cartridge cavity. ★

DANGEROUS



RADIATION!

The use of the term "dangerous radiation" in the title of this article is not meant to be a scare tactic, but rather to make a point. There are radioactive materials and radiation producing machines on all military installations, and many of them are potentially dangerous to humans.

The radiation protection business, as with many other occupations, is most effective when the public has been educated toward its goals. Therefore, you will enhance your own base radiation protection program by becoming aware that such hazards do exist, and understanding that the strict controls, which may occasionally inconvenience you, are for your own protection.

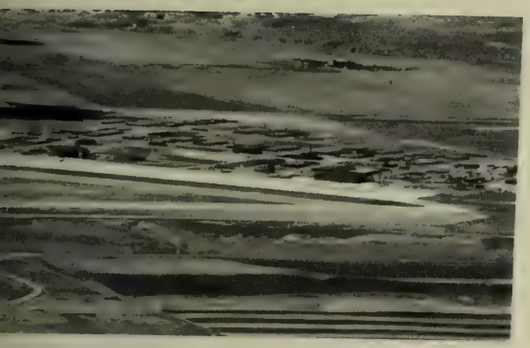
Now, here comes the education part. AFR 160-132, "Control of Radiological Health Hazards," assigns the responsibility for the base radiation protection program to the Director of Base Medical Services. Ideally, the authority for conducting this program is delegated to a Health Physicist, a medical scientist with specific educational and experience qualifications in the field of radiological health. But since the Health Physicist is a rather rare specialist in the Air Force, at most bases the program is in the hands of the Bioenvironmental Engineer, an expert in the field of environmental health with special training in radiological health. In any case, he is normally referred to as the Base Radiation Protection Officer (RPO).

This individual must be aware of and approve the procurement, use, storage, and disposal of all radioactive materials and ionizing radiation producing devices on his base. He keeps tabs on each use of radiation by maintaining close personal contact with each user, as well as by making frequent inspections and surveys of their working areas. He must monitor the radiation exposure of all personnel who might be exposed to radiation in the course of their normal duties. His program is subject to inspection by the Directorate of Nuclear Safety, Air Force Inspection and Safety Center. Programs which include one or more US Atomic Energy Commission (AEC) licenses are also subject to inspection by the AEC's Compliance Division.

Now, let's see where you would likely run across the most common sources of radiation on your base. Bases with flying missions normally have a Precision Measurement Equipment Laboratory (PMEL). PMEL's mission includes the responsibility for periodic calibration of radiation detection instruments belonging to the Base RPO, Base Disaster Control, and a few other users. This requires that PMEL store and use sources of radioactive cesium and plutonium. The quantities of these materials are relatively small. However, should PMEL personnel fail in their responsibilities to follow safe operating procedures, harmful radiation exposure could result.

Do you recall seeing the Non-Destructive Inspection (NDI) Laboratory on your base? This facility utilizes industrial X-ray machines to inspect internal portions of metallic parts, such as aircraft and missile

Maj WILLIAM B. MOYER, USAF, BSC, Directorate of Nuclear Safety



on my base?

components. NDI personnel must be specifically trained in radiation protection procedures. Since much of the x-raying must be carried out in hangars and open flight line areas, and exposure times are relatively long, NDI X-ray operators must isolate their working areas to prevent exposure to personnel working in adjacent areas. Their expertise includes a working knowledge of radiation detection instruments which they must use to determine the boundaries of restricted areas. The use of rope barriers and radiation hazard warning signs and constant visual inspection of their working area enables them to protect the unsuspecting individual who might otherwise stroll into a dangerous area. NDI personnel must also continually monitor their own exposure to insure that their accumulated doses remain within limits established as safe for radiation workers.

Here's one that may shock you! The source of radiation which can potentially expose the greatest number of people to unnecessary radiation is right in the base hospital or dispensary. You guessed it, the X-ray department. Naturally, since the X-ray is one of the most valuable tools available to the physician for diagnosing physical ailments, the X-ray department of any medical facility is one of its busiest activities. We are fortunate in that the Air Force has an excellent training program for medical X-ray technicians in which special emphasis is placed on protection of the patient, as well as the technician himself and personnel in the surrounding environment. The same hazard potential exists on a smaller scale within the dental X-ray facility. Dental X-ray technicians also have extensive training in the proper techniques for the protection of all concerned.

Actually, there can be many other potentially dangerous sources of radiation on Air Force bases. Bases with large research and development missions may have shops in which numerous radioactive materials, particle accelerators, super-voltage X-ray machines, etc., are utilized routinely. Some aircraft contain radioactive materials in luminous emergency exit markers and nucleonic oil-level gages. Printing presses often contain radioactive material for the elimination of static electricity on paper. Regardless of whether the radiation hazard is from a vial of radioactive liquid being used in a chemistry lab, a portion of an aircraft being X-rayed on the flight line, or the use of a particle accelerator to study atomic and nuclear structure, Air Force personnel involved in using these materials and devices must comply with federal directives designed to make these operations safe for the worker and surrounding population.

Although I've shown you only a few examples of radiation hazards and some of the problems which face those people obligated to protect you and your family, you can see that radiation safety, in most cases, is not "built-in." It relies on the initiative and self-discipline of human beings. Please, be "aware" and help others protect *you.* ★



Dear TOOTS

TO 32B14-3-1-101, Torque Indicating Tools, states in the CAUTION note below paragraph 7-8: "Always store the torque tool at the lowest increment torque value." The question is, what is the lowest torque value? For example: If we have a torque wrench with a capacity of 5-50 inch pounds, is the handle vernier scale positioned so that it reads zero, or so that it reads five? If the handle vernier scale is set at zero, the forward portion of the vernier scale is below (not aligned with) the five increment etched on the wrench itself. If the vernier scale is set at five, the forward portion of the handle vernier scale is correctly aligned with the five increment on the torque tool. We feel that the latter of the two positions is correct—but is it?

This may appear to be a small technical point; however, past experience has shown that Quality Control and IG inspectors make this torque tool storage setting a matter of special interest during their inspections.

MSgt Michael T. Donavon
7101st Materiel Squadron
APO New York 09332

Dear Mike

I talked with some of our inspectors and the OPR at the depot. Their interpretation of paragraph 7-8 is that the torque wrench will be backed off to the lowest reading on the scale. The 5 to 50 inch tool will be set at zero.

Caution must be exercised after reaching the lowest increment reading so as not to shear the stop pins inside the handle by further turning in this direction.

These pins are designed as a resistance point only, to enable personnel to determine when they have reached the lowest handle setting. These pins, when sheared, will allow the handle to disengage from the body and will give an erratic torque value.

Toots

Dear TOOTS

Could you please inform me as to how to get personnel to enforce safety regulations? One great problem we have is the personnel in the support shops (electric, hydraulic, sheet metal, etc.) riding bicycles out on the line on jobs. These bicycles are not reflectorized nor do they have any lights for night-time use. However, they are used and no one says anything. It seems as if no one cares in the least. What is going to happen if a flightline Metro or AGE tractor or an aircraft nails one of these unseen riders at night?

Worried Flightline Troop

Dear Worried

Worried is an excellent word to describe your concern about the situation. It would appear that supervision is lacking in your unit. When a hazardous situation such as you have mentioned exists and the supervisors appear not to notice, something is dead wrong.

Riding a bicycle in the dark without lights and reflectors is a mighty dangerous act at any time, but to have this situation on a busy flightline is unthinkable. Bicycles are a definite advantage in any organization, but policies should be established to insure their safe operation, and these policies should be strictly enforced by all supervisors.

I talked with the OPR for AFM 127-101 about your letter. They were equally concerned about this unsafe condition. Also during recent Unit Effectiveness Inspections there have been several observations of the same unsafe operations.

Pending revision of Chapter 8-2P of AFM 127-101, a letter (SEOG, 8 Apr 72) was sent out to all commands requiring the use of headlights and reflectorized paint or tape on all bicycles, Air Force or privately owned, which are operated on the flightline. By the time you read this, the letter should already be in the hands of your safety officer, and corrective actions should have been taken.

One further word of advice to all my troops out there, a quick way to bring attention to a hazardous condition is to use AF Form 457 (USAF Hazard Report). AFM 127-6 tells you how.

Toots

Dear TOOTS

My question is in regard to the proper method of storing technical orders within a work center when more than one copy of the publication is required during daily operation. Is it permissible to store two copies of the same publication side by side in the shop file? Or is it necessary to establish an additional file for the extra copy?

In the unit I just left we had our standard publications (8¼ x 10¼) filed in a separate (extra copy) file in accordance with paragraph 6-24 of TO 00-5-1. Our work cards and 06 manuals were filed with all copies side by side in the same file (paragraph 6-37 and 6-53, TO 00-5-1).

What is the correct way to maintain the file?

TSgt Jay A. Peat
Kirtland AFB, New Mexico

Dear Jay

The correct way to maintain your file is to establish an extra copy file independent of your original file. TO 00-5-1, paragraphs 6-24 through 6-26, is your reference.

Remember that this extra copy file must be correctly maintained and is subject to the same inspection criteria as your original file; however, the extra copy file need not be kept in the standard binders.

Toots

Dear TOOTS

How do we properly ground a fuel bowser (or drainage drum) when draining fuel from our B-52Gs? The local Quality Control contends, citing TO 00-25-172, paragraph 4-26g(1) (g) (Caution), that a common ground must be used. Other references in the same TO, plus TO 1B-52G-2-2 and TO 00-25-212, indicate the fuel bowser be grounded to approved ground and to the aircraft. Nothing about the aircraft and bowser being grounded to the same (common) static ground.

Capt John J. Weber, Jr
Mather AFB, California

Dear John

My recommendation is that the fuel bowser be connected to the common ground. I understand from the officials here that under certain conditions, the B-52 uses two grounds, and under other conditions only one. In the case of two grounds, you could use either one as long as you maintain the common ground triangle.

Toots

Toots

is interested in your problems. She spends her time researching questions about Tech Orders and directives. Write her c/o Editor, Aerospace Safety Magazine, AFISC, Norton AFB, CA. 92409.

TECH TOPICS

Briefs for Maintenance Techs

34 QTS OF OIL

Thirty-four quarts of engine oil —that's what it took to service engines Nr 1 and 2 after 1.3 hours of flight on a KC-135.

The aircraft was 25 minutes into the flight when Nr 2 oil pressure started fluctuating, accompanied by a low oil pressure warning light. The engine was shut down and a three engine return to base accomplished.

During postflight inspection Nr 2 engine was serviced with 22 quarts of oil and Nr 1 with 12 quarts. Both engines were ops checked with no leaks found. Breather pressure was checked and found to be within limits (1.7 inches).

Prior to this flight, Nr 1 and 2 engine oil coolers were removed to correct minor write-ups. Apparently the engines were not reserviced following this maintenance.

COMMANDERS: *Proper aircraft forms management would have prevented this incident.*

FOD WEARS MANY FACES

Foreign objects come in all sizes and shapes and they turn up just about anywhere one could imagine. Here's one that showed up in an air conditioning duct in the form of a rubber seal. There's no telling how long this little object would have remained hidden had the temperature control unit not failed.

The B-57 was on GCA downwind when the navigator removed his oxygen mask to wipe his face and reported a strong, burning rubber smell. It was also discovered that the auto temp control unit had failed. The rubber seal had been dropped in the duct by an unknown person at an unknown time. The overheated duct melted the seal, producing the odor.

This should be a reminder to all maintenance personnel that FOD is not limited to engines and hard objects such as tools, nuts and bolts. A positive way to prevent such incidents would be to know what materials—tools, etc. —are on hand during the job. Know what were used and make sure that both what were used and unused are accounted for when the job is completed.

WHERE'S THE SUPERVISOR?

One evening not long ago, when an airman drove a Metro van on the flightline, he had four things going against him. He didn't have a government vehicle operator's permit, lacked training in flightline operations, exceeded the speed limit, and failed to allow adequate clearance between his van and a parked F-4. As a result, he totaled the Metro and caused $943 damage to the F-4. In addition to receiving a letter of reprimand, the airman will most likely be required to pay for the vehicle. The question: What kind of supervision set up this senseless accident?

(USAFE AIRSCOOP)

NEAR DISASTER

Deviation from procedures or, perhaps, lack of a clear understanding of the established procedures, coupled with one supervisor overlooking a critical item during inspection, led to an engine bay fire on takeoff roll. Only quick action by the aircrew saved this F-4 from major damage and possibly total destruction.

A test cell run was completed on an engine. The test cell supervisor, thinking the engine would be scheduled back through the shop for quality assurance inspection, failed to assure that all components disturbed during test cell operation were restored to their original condition.

Due to a shortage of engines this one was delivered directly to the aircraft from the test cell. An engine conditioning supervisor performed the pre-installation inspection, but failed to detect the unsafetied A/B primary core fuel line cap. The engine was installed, trim run completed, and the aircraft released for flight. Three sorties later, after approximately three to five seconds of afterburner operation during takeoff roll, the right fire light came on. An abort was initiated, but the fire light remained on so the engine was shut down. As the F-4 turned off the runway, the crew saw smoke coming from the right engine, so the left engine was shut down and the aircraft evacuated.

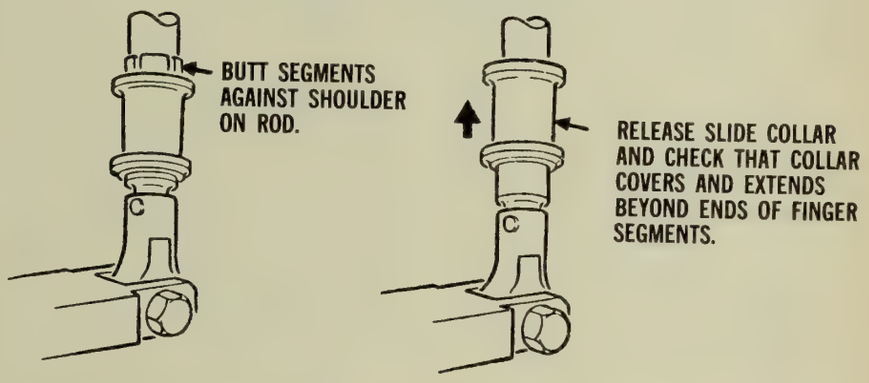
The unsafetied primary core fuel line cap that the engine conditioning supervisor did not detect vibrated off, allowing fuel to spray into the engine bay during A/B operation.

T-38 THROTTLE LINKAGE

During recovery from a traffic pattern stall at 17,000 feet, the right engine RPM remained at 95 percent regardless of throttle position. The aircraft returned to base and the engine was shut down at touchdown with the fuel shut-off switch.

Investigation found the throttle quick disconnect disconnected. This engine had been installed 27 hours prior and no further maintenance had been performed before this incident. Following a thorough inspection, the quick disconnect was found serviceable. Apparently it had not been completely locked during engine installation.

When connecting the throttle quick disconnect linkage, extreme caution should be exercised to make sure that the slide collar extends beyond the ends of finger segments.



WHO CLEARED THE RED CROSS?

RB-57, flight level 2500 feet, 140 knots, 40 degrees left bank. The pilot applied stabilizer trim but got no response. The wings were leveled, but the aircraft remained in a slight nose low attitude. The pilot could not pull the control column back with normal force. After using maximum force in addition to trim attempts, a loud snap was heard from the rear of the aircraft and normal control was possible. The aircraft was returned to base without further problems.

The lower left stabilizer actuator bushing was missing, which allowed the actuator to shift to the left and bind with the aircraft structure.

It could not be determined when this actuator was last installed. It is believed that the aircraft was delivered to the unit minus the bushing.

When the actuator was installed is beside the point. **Who cleared the red cross** is the critical question. Did the inspector just sign the "inspected by" block? Or did he check the installation but fail to notice the missing bushing? In either case the result was the same: a flight control deficiency that could have ended in disaster.

TECH TOPICS

TROUBLE-SHOT!

Sgt Doe was dispatched to troubleshoot the egress battery test lamp on an A-1H. After checking the aircraft forms, he proceeded to check the system and discovered that the hot wire from the jettison battery was broken and hanging by a few strands at the test switch terminal. Sgt Doe disconnected the wire from the switch and installed a new terminal end on the wire. At this time the left canopy thruster fired.

Cause: Failure to follow tech data. TO 1A-1H-2, paragraph 2-181, requires that the cannon plug connecting the two thrusters be disconnected. Failure to disconnect the cannon plug put Sgt Doe in a position of working on a hot system. When he accidentally touched the hot wire to the terminals of the switch, the circuit was completed and the system fired as designed.

Perhaps the maintenance man was trying to save time. Or was it just plain negligence? Following tech data during all maintenance will prove to be the best time saver.

FUEL CONTROL RIGGING

A T-37 right engine flamed out during spin recovery at 20,000 feet and airspeed at or below 50 knots. A successful airstart was obtained at 18,000 feet followed by a successful recovery at home base.

Cause: The right fuel control protractor pointer was found set on two degrees instead of the required 12-14 degrees. This low protractor setting caused the engine to flame out at altitude when the throttle was placed in the idle position.

This unit has initiated a training program to include a step-by-step procedure for correct throttle and fuel control rigging.

How is the training program in your unit? Could your maintenance personnel and safety be improved with this type program?

ENGINE CONTROL LINKAGE

We can't seem to get away from incidents involving disconnected engine control linkages. It appears that the technicians are dropping the ball after adjustments are made and the operational checks are complete. Frequently they either fail to retorque the connecting bolts or fail to install the cotter pin.

Here are a few examples:

- B-52—Nr 8 engine went to 70 percent during cruise. Throttle movement had no effect. The power control rod had not been safetied, allowing the linkage to disconnect in flight.
- RF-4C—At level-off when throttles were retarded, the right engine RPM remained at 100 percent. Neither front nor rear throttle had any effect on the RPM. The throttle crossover shaft was found disconnected from the torque booster clevis shaft. It was the fourth sortie since maintenance was performed in this area.
- Another B-52—One plus fifteen into the flight, Nr 8 engine flamed out; restart attempts were unsuccessful. The throttle linkage was found disconnected. The linkage jam nut had not been properly torqued during engine installation.

A thorough supervisory inspection prior to closing the engine door (cowling) would have prevented these incidents. Confidence in your troops that did the job is fine, but you supervisors also owe these troops support by insuring that the job was completed to the last detail. This is accomplished by performing a careful inspection before signing the forms.

UNDER PRESSURE

A KC-135 was launching during a no-notice ORI when a hangfire occurred on Nr 4 engine. The crew chief, who was on the ground headset, directed that a pneumatic cart be connected and the pilot was cleared for a second start attempt. The engine started but the starter was damaged from excessive energy from both sources (cartridged and pneumatic air).

The ORI commitment was completed but the starter had to be changed. This was one of those cases where maintenance allowed the pressure which goes along with increased operational commitments to lead them away from established procedures.

TO 1C-135(K)A-2-4, para 8-17 through 8-36. has several warning notes against engine start attempts following hangfire or misfire. It also warns against removing malfunctioned cartridges for a period of five minutes following these mishaps.

Also SACM 178-1, para 11-5, states that if a start cartridge malfunctions during engine start, maintenance will wait five minutes, then remove the cartridge before starting the engine with bleed/external air.

It was not reported as to what the pilot directed the ground crew to do after the hangfire, but he cannot be completely absolved. The flight manual also warns against handling hangfired cartridges until at least five minutes have elapsed.

Follow the TO, observe the warning notes. This is the only professional way.

A FEW THINGS MISSING

The following episode would have furnished rich material for the Keystone Cops—except it was not a bit funny.

An F-4 had been on alert for a short period when the word was received to increase the load. The load crew arrived at the aircraft to find the aircraft armed (all safety devices removed) for immediate launch. An aircraft crew chief was requested to install the safety pins.

The load team proceeded to prepare the weapons for upload. After about 10 minutes, when the aircraft crew chief had not shown up, the load crew decided to go ahead and started to dearm the aircraft by removing the jettison cartridges from the outboard MERs. The load crew stopped again briefly to await the aircraft crew chief; however, after a few minutes, they decided to go ahead without him. They started to load the two inboard MERs without completing the dearming. (Ed. Note: This crew was not using any type checklist.)

The outboard pylon cartridges and safety pins were installed, the inboard pylons were safety pinned but had no cartridges installed, the Aero 27 and two aft Aero 7A racks had cartridges installed but not safety pinned, no egress safety pins were installed. The armament placard read HOT and there was no entry made in the 781-A.

The Nr 2 man climbed in the cockpit to functionally check the system. The master arm switch was positioned to arm, the left inboard station was selected, and power was applied to the aircraft. The man then depressed the armament override button. He is unsure just what he did next, but the centerline tank and two AIM-7 missiles jettisoned to the ramp, and the outboard MAU-12 racks fired.

We could list a dozen deficiencies in this operation, but will mention only two: supervision and use of tech data. This crew lacked both.

PLANNED ACCIDENT

An apprentice aircraft maintenance technician failed his proficiency test as a tow team member, but training control never sent word of this failure to his unit. His supervisor violated a local MOI by not bothering to check the airman's training records and test results. These mistakes were the building blocks for an almost inevitable accident.

The young airman was acting as the brakeman in an F-4 being towed by a tug. The NCO who was acting as the tow team supervisor was not carrying out his duty as nose walker but was instead riding on the tug. When the driver made a sharp left turn, the rear of the tug skidded to the right and the tow bar broke at the shear point. The brakeman pulled the emergency brake handle but made no attempt to apply the brakes, and the aircraft struck the tug. The aircraft boarding ladder was broken, the nose of the left external tank was dented, and the G & C unit of an AIM-7 was damaged. Each man on the towing team contributed to this accident, but another person was responsible also—the man in training control who mishandled the paperwork. ★

(USAFE AIRSCOOP)

a case for fuel tank inerting

T. O. REED, ASD, Wright-Patterson AFB, Ohio

Nothing can disrupt a flight plan quicker than a fuel tank explosion. The vulnerability of fuel tanks to accidental ignition has been a nagging aeronautical safety problem ever since Wilbur and Orville poured their first gallon of octane at Kitty Hawk.

On the surface, the problem seems to be a paradox: How can you keep a highly combustible fuel from igniting and still have a highly combustible fuel?

The answer is a concept called "fuel tank inerting." It has allowed us to develop fuel tanks that are explosion-proof.

One of the most effective inerting methods found to date involves packing fuel tanks with open-pore polyurethane foam. The foam arrests flame propagation, whether it be from a bullet puncture, lightning or any other ignition source.

THERE IS AT LEAST ONE incident on record that proves the reliability of foam inerting: It happened on the ground during a thunderstorm at Pope AFB, South Carolina, in June 1970. There was a loud clap of thunder outside one of the hangars. Ground crewmen turned in time to see a puff of smoke swirl from a wing vent of a C-130E parked on the flightline. The plane had just been refueled.

A quick inspection revealed that a three-foot section of grounding cable near the single point refueling adapter was burned. There was no doubt that the aircraft had been struck by lightning in the vicinity of the Nr 3 main tank fuel filler cap.

Normally, there would have been an explosion and fire, and the C-130 would have gone to the highest bidder in the scrap metal market. But this was no normal situation. The fuel tanks of this particular aircraft were packed with foam inerting material.

Inspection revealed no evidence of damage to the aircraft structure or accessory systems, so the aircraft remained operational until several months later, when the Nr 3 main fuel tank was opened during IRAN. Not until then was the seriousness of the lightning strike and the effectiveness of the foam fully appreciated.

It was discovered that lightning had entered the tank in the filler cap area with such energy that the fuel filler foam guard (screen) was partly disintegrated and an area of foam approximately three feet in diameter burned. The foam zapped the lightning!

COMPARE THIS incident to an accident in 1970, when an ignition source near a JP-4 vapor-filled tank opened for repair resulted in a series of fuel tank explosions that destroyed a test aircraft. Or compare it to the commercial airline flight that was struck by lightning over Elkton, Maryland, in 1963. Most likely lightning entered the fuel tank through the vent system and caused a mid-air explosion, resulting in the loss of the aircraft and many lives.

It is highly probable that fuel tank inerting would have prevented these accidents.

ANOTHER effective inerting method involves the use of nitrogen, which replaces air in the fuel tank. It requires the system to be recharged with nitrogen after each refueling. Experimental work also is being done with catalytic reactors and "sorbent bed" inerting techniques.

The technique of foam inerting was developed by ASD and the Aero Propulsion Laboratory at WPAFB in 1966 to protect aircraft from ground fire in the SEA environment. Installations have been completed in over 200 aircraft including C-130, AC-119, C-123,



Overview of burned foam in the area of the Nr 3 main tank filler cap and dual level control valves.



Side view of burned foam piece at fuel filler opening.

Typical foam installation into outboard fuel tank on C-130 aircraft.



C-47, F-105, A-7, OV-10, O-2, F-4, A-37 and others.

The principle by which the foam works relates to its small pore size (10 pores per inch) which acts as a flame arrestor and prevents flame propagation. The penalty incurred for this full time protection is quite nominal at four percent fuel loss, of which 2.5 percent is by displacement and 1.5 percent by retention of fuel. The net weight increase is about 0.06 lbs/gallon.

Efforts are under way to reduce this penalty through use of a lighter weight material (30 percent less than the present orange foam) and by voiding concepts (preplanned cut-outs in the foam) without sacrificing inerting characteristics.

As an example, voiding concepts have been proposed where up to 80 percent of the material can be removed from a fully packed configuration. However, these concepts will require a much finer pore size, such as 15 ppi, to prevent flame propagation between voids.

New materials currently being qualified include a nominal 15 ppi yellow foam for fully packed configurations, and a nominal 25 ppi red foam for voided systems. These materials are expected to be available for fuel tank use within the next few months under the present foam specification (MIL-B-83054).

It is conceivable that eventually the use of fuel tank inerting will be a standard requirement on all military and civilian aircraft for explosion and fire safety under all flight and ground maintenance conditions. ★



MAIL CALL

hazard reporting

Been reading your publication for about 25 years. Even way back when it was referred to as Flying Safety Magazine. I am sure you'll be pleased to know it took me 25 years to find something I don't quite agree with. Ain't no biggie but since I have been involved in processing Hazard Reports for some time, I do not understand a statement made in the February 1972 issue, "Management in Action—SHOW ME."

Well, I hope to show you. After 25 years in this bustling Air Force as an Air Traffic Controller my memory is not so good so I'll quote.

"HR (USAF HAZARD REPORT) Disinterest. Disinterest and poor administration degraded the HR program—only four HRs were submitted during the first four months of the year."

The article went on to say some good words about a successful HR program and who kills the program because of laziness, disinterest, or complacency. With all of those good strong words, I wonder how the most important point in the whole HR program was missed.

ARE WE JUST LOOKING FOR VOLUME?? DO WE JUST HAVE TO FILL A QUOTA?? OR are we looking for real hazards? Now, we old, broken-down, bleary-eyed controllers take this Hazard bit a mite serious. We are prone to get upset when a pilot (IN PURE VFR CONDITIONS) reports looking out of his cockpit, sees another airplane and acts as though his "solitude with God" has been violated—and we are at fault.

Again—VFR—SID DEPARTURE—DEVELOPED WITH IFR PROCEDURES IN MIND—TAKEOFF—Weather clear/15—max rate climb to one thousand—rack a tight VFR turn—get nose to nose with an F-104 on the break for downwind—again HR—ATC. Really??

I could go on for several pages citing supposedly HRs that are not HRs. But, once submitted, the whole gauntlet of the paper war must be traversed. Perhaps my command (AFCS) takes a little more interest in HRs concerning our service. After all, we who are in the towers see the whole airpatch, in the radars see tracks of flight within 40/60 miles; we are involved in some of the results of uncorrected hazardous situations—they are not pretty. So—we are concerned with HAZARDS, and safety of flight, and pilot comments, and air traffic control services, and proper NAVAID operation and user satisfaction. Otherside—we ain't interested in paperwork hazards that just satisfy numbers. With all due respect, Sir, I submit that four real hazards in four months, accomplishes a hellavah lot more than four real hazards hidden in the middle of a myriad. Since we are under MANAGEMENT, let us follow a basic principle, weed out the chaff, and spend our time on the real problems. Square filling is for squares. Limbo gets a lot of square fillers.

CMSgt EUEL J. CLOUD
Griffiss AFB, New York

Your point is well taken. However, in defense of the statement, four hazard reports in four months are not very many. You seem to be taking a narrow—but natural—view. Hazards are not confined to the air traffic situation; rather they are present in all areas, as evidenced by the incidents that occur daily. In our view, when a person detects what he considers to be a hazard he would be remiss not to report it. We doubt that very many people take the time and trouble to report hazards that do not seem real to them.

"Know Your Systems" Mar 72

In your March 1972 issue, you had an article entitled "Know Your Systems?" under Ops Topics.

The article was apparently about a C-130/A model since the hydraulic pressure (for brakes) came from Engine No. 2 and Engine No. 4. In this case, there is no aux pump to turn on since the "A-Model" uses an air turbine motor driven hydraulic pump for emergency pressure. The ATM is unusable while making a bleed air check.

The later models (C-130s) would not have utility pressure from No. 3 engine either, but, they have the aux pump and your procedure would apply.

Know Your Systems? I believe Murphy was present when the article was written.

Maj WALTER J. GODWIN
Andrews AFB, Maryland

Right you are! The author, project officer and a telephone call to an A-model unit all failed to detect the goof. As we said, Murphy is always *present. The emphasis should have been placed on procedures to prevent the aircraft from running into objects even with a brake malfunction. Designated run-up areas and proper use of chocks are alternatives worth considering.* ★

☆ U.S. GOVERNMENT PRINTING OFFICE 1972 789-129/10

UNITED STATES AIR FORCE

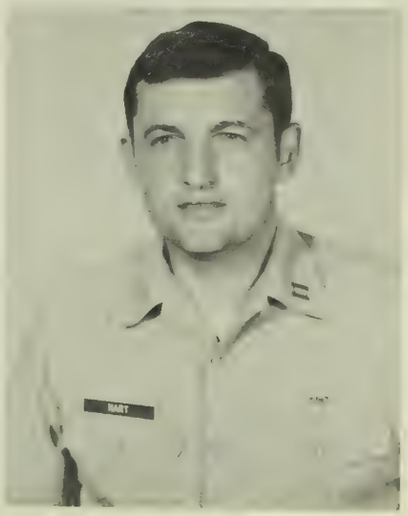
WELL DONE AWARD

Presented for outstanding airmanship and professional performance during a hazardous situation and for a significant contribution to the United States Air Force Accident Prevention Program.

Captain
PETER D. ROBINSON

Captain
ANTHONY P. HART





432nd Tactical Reconnaissance Wing, APO San Francisco 96237

On 1 September 1971, Captain Robinson and Captain Hart flew as "Fast Forward Air Controllers" in and F-4D, on a combat mission in Southeast Asia. Their target was a well-defended enemy position, and weather conditions made it necessary for Captains Robinson and Hart to mark the target prior to each fighter pass, in order for the fighters to maintain visual contact.

On the third marking pass, Captain Robinson's aircraft was hit by ground fire, which severed the number two power control system, punctured the utility hydraulic system return line and severed the tail hook cable, allowing the tail hook to fall to the fully extended position.

Captain Robinson immediately climbed to a safe altitude and set course for the nearest recovery base. At this time, his only control over the aircraft came from the number one power control system, which operates the left aileron, left spoiler and horizontal stabilator, and from manual control of the rudder.

The return flight was marked by severe aircraft oscillations, which worsened as the airspeed was decreased to lower the gear with the emergency system. At speeds below 185 knots, control was extremely marginal. Captain Robinson completed his controllability check, fixing the minimum safe speed at 190 knots, and maneuvered the aircraft to a no-flap straight in approach. At 190 knots, almost full left aileron and left rudder deflection were needed to maintain wings level.

Oscillations intensified during the approach, but with Captain Hart assisting by holding in full left rudder, Captain Robinson brought the aircraft in and made a successful approach end barrier engagement.

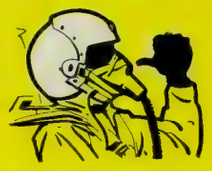
The skill and resourcefulness displayed by Captain Robinson and Captain Hart, under extremely trying conditions, resulted in the successful recovery of a valuable aircraft. WELL DONE! ★

* * * * * * * * *

RADIO OUT- visual signals



DESCEND TO LOWER ALTITUDE: Hold hand at top of canopy, palm down, fingers extended and joined, move hand forward and down.



FUEL CHECK: Close fist with the thumb extended and perform drinking motion with thumb touching the oxygen mask.



FUEL REMAINING: Extend one finger for each 1000 lbs of fuel onboard. Extend finger(s) vertically for 1000-5000 lbs; horizontally for 6000-9000 lbs. After signaling 1000 lb increments, close fist and signal 100 lb increments in the same manner. To signal zero, form a circle with finger and thumb.



HEFOE SYSTEM: Clench fist and hold it at top of canopy, then hold up the required number of fingers to denote which system is involved (see a through e, following). The receiving pilot acknowledges the signal by repeating it. a. Hydraulic—one finger; b. Electrical—two fingers; c. Fuel—three fingers; d. Oxygen—four fingers; e Engine—five fingers.



I MUST LAND ON YOUR WING: Pat shoulder, palm down; use right hand for left shoulder, and vice versa, to prevent confusion with other signals. Other pilot must give an OK signal; the basic signal indicates a jet approach speed of 130 knots. If higher approach speed is desired, raise one finger for each 10-knot increase.



LAND IMMEDIATELY: Close fist and hold it to the top of canopy, with thumb extended downward, then move arm up and down rapidly. (Do not confuse this signal with "GEAR DOWN" signal, which is not used at altitude.)



RADIO INOPERATIVE: Fly aircraft along the side of the landing runway, 1000 feet above the field elevation, rocking wings until it reaches end of the runway. Turn to downwind and check mobile control and/or tower for green light on base leg and final approach.



RECEIVER FAILURE: With palm of hand over ear position, move hand forward and backward.



TRANSMITTER FAILURE: With palm of hand toward and in front of the face, pilot moves hand up and down.

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Aerospace SAFETY



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UNITED STATES AIR FORCE **JULY 1972**

Aerospace SAFETY

FOR AIRCREWS, MAINTENANCE & SUPPORT TECHNICIANS

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DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

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JULY 1972 AFRP 127-2 VOLUME 28 NUMBER 7

SALUTE TO EXCELLENCE

This issue of *Aerospace Safety* salutes the winners of the 1971 safety awards described in AFR 900-26. Spirited competition for the prestigious organizational awards made selection among the top contenders extremely difficult. Finally, after many hours spent minutely scrutinizing the nominations, the Board selected Air Training Command and Southern Command for the Secretary of the Air Force Trophy.

One of the newer awards, the Chief of Staff Individual Safety Trophy, stimulated a tremendous increase in interest with twice as many nominations as for the preceding year. Unfortunately, only four nominees could be selected from a very highly qualified group of candidates. The names of the winners and a brief statement of their accomplishments are presented on page 17.

Three other outstanding achievements, two by organizations and one by an individual, are annually recognized by awards of long standing: The Major General Benjamin D. Foulois Memorial Award (formerly Daedalian Award) presented annually by the Order of Daedalians to the major command having the most effective aircraft accident prevention program for the preceding calendar year; the Colombian Trophy, established in 1935 and presented annually for the most meritorious achievement in flight safety attained by a tactical organization; the Koren Kolligian, Jr., Trophy presented by the Kolligian family in memory of their son, an Air Force pilot, who was lost in an accident in 1955.

1971 was a year of outstanding accomplishment in flying safety for the Air Force. Consequently, competition for all the safety awards was very keen. This was reflected by the qualifications of the candidates, the magnitude of their accomplishments and the quality of the nominations, which were unusually well written and documented.

To each of you who were held in such high esteem by your Commands that they considered you worthy of the individual awards, we would like to offer our sincere appreciation for a job "well done." In the final analysis, it was your effort, innovations and dedication that produced the low rates the USAF recorded last year, in recognition of which, we are proud to be able to give this small degree of recognition.

The awards and winners are presented on pages 16 and 17, with winners of Safety Plaques listed on the back cover. ★

Pilot Error



"The only way to get a zero accident rate is to ground all the airplanes."

"As long as there's a mistake to be made, somebody will make it."

"You gotta expect some losses."

BALONEY!

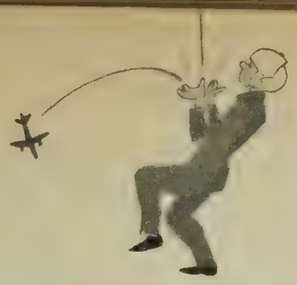
Reach into the hat. Pull out a "pilot error" accident at random. Don't let me see it! Now, without looking, without touching, with one wave of my hand, this very hand, I will tell you . . . that accident could have been—should have been—prevented! Right? You bet your bailout bottle I'm right!

There are 24 "pilot error" accidents in a run we just pulled out of the computer. It's monotonous, the way they fall into nice, neat categories. Group them up and they sing an old, familiar song.

There was one midair in the group. Nobody saw; nobody avoided.

There was one case of a fighter pilot who departed the range and entered an area of low ceilings, reduced visibility and rising terrain. The end was entirely predictable. His wingman maintained formation integrity.

Four accidents occurred during takeoff. A C-47 IP tried to get airborne after leaving the runway, rather than abort. He didn't make



it. Another taildragger ground-looped on takeoff—pilot forgot to unlock his castering gear and the Ops officer wasn't notified of weather warning for high winds. An F-100 pilot ignored his precomputed takeoff data, rotated prematurely to an abnormally nose-high attitude and never quite got out of ground effect. Another jet type elected to let his squat switch do the work for him and raised his gear handle prior to liftoff. V-e-r-r-ry impressive!

The old spin/stall in the landing pattern trick cost us three birds—plus the aircrews. A student pilot in a T-38 overshot final and stalled in; ejection attempt unsuccessful. An A-37 pilot did the same thing. The pilot of an RF-101 didn't like the landing he was making in a gusty crosswind, tried to go around, entered a "pitch-up" and crashed.

There was one hard landing mishap. The pilot of the F-105 was in the soup making a radar approach. The final approach was so erratic that GCA directed missed approach, but the pilot transmitted that he was going to press down a bit farther and see if he could pick up the runway. He did, although it took some fancy maneuvering to line up. The landing was 340 feet past the approach end, after application of MIL power and a flare so abrupt that the aft end of the bird touched along with the main gear. The impact was sufficiently hard to slam the nosewheel, blowing the tire, and causing the tailhook to drop. The pilot then raised the nose for aerodynamic braking, and the tailhook snagged the approach-end barrier, slamming the nosewheel again and shearing the nosegear.

THREE PILOTS ARRIVED with red faces—mostly from the reflection of the light shining in the gear handle. In no case was there anyone on the ground checking landing configuration.

Three pilots made it to the runway but couldn't keep it there. One low-time F-101 pilot left the runway in a gusty crosswind. His Operations section recognized—informally—that low time pilots should have more restrictive crosswind limits than those published in the Dash-one, but had taken no steps to establish those limits. A T-38 IP and student landed long and hot, blew the tires, left the runway and sheared the gear. Another F-101 started to weathervane and hydroplane after dragchute deployment. The pilot jettisoned the chute, lowered the nose and tried to control it but found neither nosewheel steering nor brakes had any effect. The bird hit a snowbank on the attempted go-around. Turned out he hadn't slowed down enough for brakes and steering to be effective. It also turned out that the flight had been cleared in violation of local crosswind limits.

BY FAR THE LARGEST category is the loss of control during flight. One T-Bird, acting as target for a low-altitude intercept mission, rolled over and dived into the ground. Another T-Bird bit the dust during a spin data test; investigation disclosed many supervisory ramifications, including an elapsed time of eight weeks between spin demonstration and the spin data flight. In another testing situation, a UH-1N test pilot retarded one throttle for single-engine testing, but the other throttle followed; at least part of the ensuing crunch has to be due to the slim margin for error built into the test parameters. One bug-smasher type flew into weather and turbulence the pilot couldn't handle. And one fearless pilot, flying an airplane which he suspected of having a control problem, elected to continue a weapons delivery mission and snap-rolled into the ground out of the final turn.

UNDER ANALYSIS, a great many "gaps in coverage" emerge. In many cases, the pilot's judgment was notably deficient, and we wonder where, in the process of *educating* that pilot, we failed to get through. In many cases, the pilot's training was notably weak, and we wonder why, in the process of *training* that pilot, we failed to provide what he needed. In a number of cases, the pilots involved were very short on time—less than 20 hours in the previous 90 days, less than 50 hours in type—and we wonder why our *scheduling and supervision* failed to allow for less-than-optimum proficiency when aircrews were matched against missions. In one case the pilot was flying on a waiver of crew rest, and fatigue could well have contributed to the accident. In almost every case, there was a deficiency in supervision which contributed, directly or indirectly, to the accident.

In *every* case, the accident could have been prevented. Better education, better training, better supervision or a combination of all three would have beaten the "inevitable" accident. ★

PREVENTING MIDAIRS IN TERMINAL AREAS

While there has been a drastic decrease in the past 20 years in the number of midair collisions involving USAF aircraft, a midair is potentially so serious that we cannot afford any semblance of complacency.

The avoidance of midair collisions depends on the air traffic control system and the actions of human beings—air traffic controllers and aircrews. It is the latter, primarily but not exclusively, to whom this article is directed.

The midair problem is not a simple one. As long as more than one airplane is flying, the collision potential is present. And as the number of aircraft increases and operations in terminal areas grow in number, the probability of collisions increases, unless effective remedial actions are taken. Therefore, the following is concerned with terminal areas.

All of our readers are, or should be, quite knowledgeable of traffic control procedures and practices. This knowledge does not, however, preclude the possibility of a midair collision. There are several reasons:

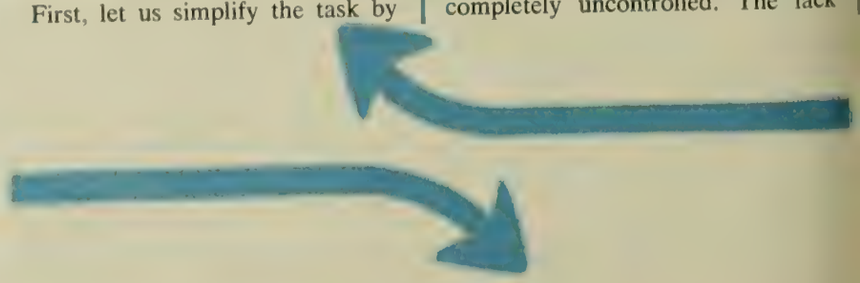
- A mix of IFR and VFR traffic and aircraft of widely differing capabilities.
- At most USAF bases there is not a total radar environment for traffic control.
- Other than USAF aircraft fly in and adjacent to USAF control zones.
- Aircrew tasks are more numerous in the terminal area, making constant attention outside the cockpit difficult.

It is axiomatic that devising solutions depends upon defining the problem. The prevention of midair collisions is a very complex problem and we're not certain that it has been defined with anything approaching 100 percent accuracy. Nevertheless, we're going to offer some possible solutions.

First, let us simplify the task by eliminating a couple of distracting factors. One of these is associated aircraft, i.e., aircraft flying in formation, refueling, etc. Collisions between such aircraft are a difficult problem requiring other solutions. Studies have indicated that the greatest number of midair collisions occur within terminal areas—during approach or in the traffic pattern, and over navigational fixes.

There is a funneling factor in air base terminal areas where traffic converges to a narrow path over the ground toward a single glidepath to a common touchdown point. The problem of separation is aggravated by a confusing mix of aircraft flying at different speeds, using various traffic patterns, different radio frequencies, IFR and VFR flight plans, as well as by different levels of pilot knowledge and ability.

Adding to the confusion is the fact that there are usually several different agencies controlling traffic within the area, and some traffic is completely uncontrolled. The lack



of a single agency to control *all* traffic in the terminal area is a serious problem which has been present in midairs involving USAF aircraft.

The problem for the Air Force is further complicated by operations from joint use bases and by uncontrolled airports existing within the control zone of an Air Force base.

One solution would be to establish mandatory IFR operations where possible, or at least during certain hours. This, of course, would depend upon the manpower and equipment available. However, even at undergraduate training bases and tactical and gunnery training bases, mandatory IFR would probably be feasible after normal duty hours.

RADAR ADVISORIES

Most of us are familiar with Stage I radar, although there seems to be a lack of understanding among many general aviation pilots, and even some military. Stage I is a radar advisory service for VFR aircraft. However, it is dependent upon the controller's immediate workload, so there's no guarantee of its availability. Nevertheless, it is a useful service which points to the possibilities to be realized from more comprehensive radar coverage, which is called Stage II.

Stage II radar service provides arriving VFR aircraft with wind and runway information and sequences them with IFR traffic.

The important thing about Stage II is that it places VFR aircraft under radar surveilance in the most congested traffic area. The procedure is for the VFR pilot to call in 20-30 miles out and request the service. The pilot is given instructions on where to enter the pattern or may be provided radar vectors to properly sequence him in the pattern. But remember, availability of this service is based on controller workload.

Stage II is available at a number of bases and airports in the CONUS, and the Enroute Supplement contains information.

Stage III is the next logical step, which will provide IFR and participating VFR aircraft with traffic separation. Stage III is mandatory for all USAF aircraft at a few bases.

One of the problems with these services is that, even where they are available, many pilots won't use them. Another problem that arises at Air Force bases results from multiple control. FAA may be providing the service but the aircraft must be turned over to USAF tower control.

The Air Force has long been a leader in the use of radar for air traffic control. This interest is continuing with a long range Air Force Communications Service modernization program. This program contains a number of elements designed to decrease the midair collision potential in the vicinity of Air Force bases. Hardware includes:

• TPX 42A (interrogator set). This system translates the output of a beam transponder in the aircraft to a visual display on the controller's scope. Mode and code of each aircraft are displayed, as well as altitude in 100-foot increments. The controller is furnished an automatic monitoring capability to detect emergencies or loss of radio communication within 200 miles, and he can filter out aircraft not required to be displayed. First production model is expected to be in service next fall.

A follow-on to the TPX 42A will provide identification of each aircraft under control and its ground speed.

• GPA 133 (Brite System). These radar indicators designed for daylight use are already operational in some USAF and FAA control towers. The controller can see the position of each aircraft even in bright daylight. The Air Force has bought 110 of these and they all should be installed by July 1973.

• GPA 131 (video mapper). This electronic map permits up to five different scope presentations for controllers' use in detecting special patterns, corridors, danger areas, navigational aids, runway locations, airway borders or centerlines, Standard Instrument Departures, etc. The mapper will be valuable in keeping aircraft out of danger areas and lined up with correct paths. The GPA 131 should be in operation by mid-1973.

• A sophisticated radar air traffic control simulator is already under contract and is expected to be operational at Keesler AFB within 12-18 months. This device will train four student controllers at one time in a realistic setting not before possible except during practice in live situations. Problems can be pre-

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JASU- (MA–1A), (MC–1A), 4(MC–2A), (MD–3A), (MD–3M)
FUEL- A+J4, SP, W, WAI, O–128–133–148 LPOX LOX
A–GEAR
RWY 14 ——— BAK–11/BAK–12 (1) RWY 32
(204' OVRN)

STAGE III RADAR SVC- Call SACRAMENTO APP CON 25 NM out on 327.5 125.4

sented and re-run to permit analysis of the student's mistakes. The trainer can set up complicated problems involving rain showers, tornadoes, variable densities of ground clutter and ECM.

AIR BASE ENVIRONMENTS

There are myriad conditions a commander must address in providing a safe environment in the air base terminal area. And each base has its own peculiar set of conditions, such as proximity to other airports, cities, towns, highways, low altitude airways, terrain, rivers and other features used as aids to navigation. There are conflicts with approach and departure routes of other airports to be considered, ATC facilities and locations, traffic patterns.

One approach that has been used successfully by a number of bases is a council consisting of local authorities and users and operators of airports in the vicinity. A variation of this in which the local traffic problems were analyzed and presented to aircraft operators and airport officials has been used by the 3510th Flying Training Wing at Randolph AFB *(Aerospace Safety,* December 1971).

Most of this article has been devoted to air traffic control, primarily through the use of radar. But there are other aspects. The see and be seen concept will be in force for a long time to come, and probably will never be completely eliminated unless air pollution eventually produces a 100 percent IMC environment. Therefore, there are other considerations involving conspicuity. Paint to serve this purpose has been used by the Air Force quite successfully but the quality of paints and cost, along with other considerations, led to curtailment of the use of conspicuity paint on USAF aircraft. Perhaps the development of better paints will reopen consideration of this means of making aircraft easier to see.

Directorate of Aerospace Safety studies conducted in the fifties recommended the use of strobe lights on aircraft. Yet today only a few USAF aircraft are so equipped. Hopefully, a program to install high intensity lighting will be accelerated.

Collision Avoidance Systems have been thought of by many as a panacea for preventing midairs. These range from simple pilot warning indicators to highly sophisticated systems that indicate to the pilot the existence of a threat and which way to go to avoid it. There are two basic approaches and no standard has yet been set as to which will be implemented.

Perhaps someday all Air Force aircraft, perhaps all aircraft flying, will be equipped with some form of CAS. However, these systems are expensive, and much development remains to be done. Therefore, while there's much to be said for the use of a CAS, we do not now have such a system and probably won't for some time. This means collision prevention is dependent on two factors:

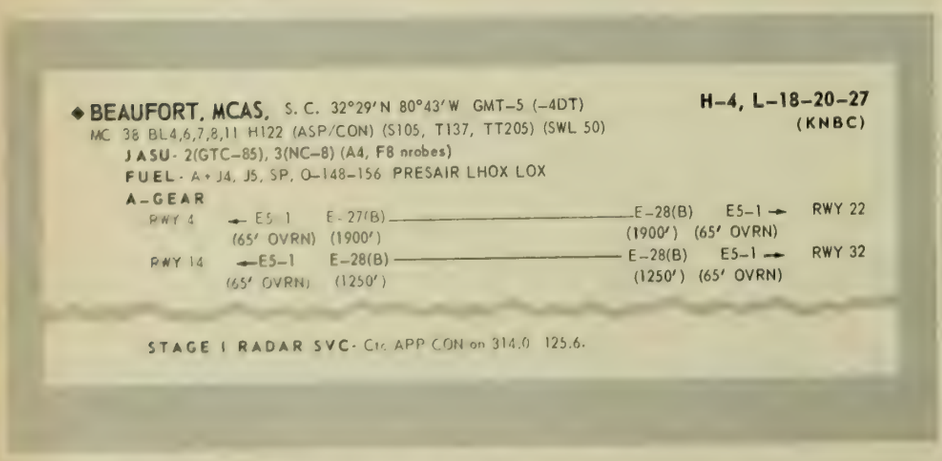
- Ground Control (primarily for IFR aircraft).
- Pilots using the see and be seen method.

WHAT CAN PILOTS DO?

The pilot is frequently named as the cause factor in a midair collision. To protect his life and to avoid the onus of being named the cause factor in a midair, there are several things he can do to prevent collisions. None is new, but they are repeated here, especially for the "new guys." The pilot can:

- Take advantage of the stages of radar monitoring now available and becoming more common.
- Develop the technique of scanning so that he knows how to "see." Stan/Eval and proficiency instrument checks can be oriented to include evaluation of a crewmember's practice and knowledge of see and be seen. ("Light Plane—12 O'Clock," *Aerospace Safety,* February 1969.)
- Keep his head out of the cockpit in VMC. Precision instrument flying to the last foot and knot is of little value if the aircraft collides with another.
- Realize that his aircraft is protected under an IFR flight plan from other IFR aircraft only. That feeling of euphoria that comes with a controller's "positive identification" should not serve to put blinders on pilots.
- Use on-board radar, on aircraft so equipped, for the navigator to monitor VFR approaches. ★

(Based on a study by Lt Cols David Elliott and Sam Henley, Directorate of Aerospace Safety.)



HEAD UP...GEAR UP

Most of you will read this article. A lot of you will talk about it for a while, and then —one of you will go out and land his bird *gear up.*

Much study and many words have gone into "why" pilots fail to lower the gear for landing, but as yet we haven't devised *the* answer. All the warning lights, horns, and indicators haven't (and won't) prevent our next full slide. About all we can do is tell you about some "most embarrassing moments" experienced by other pilots in hope that you get the clue, and recommend that you work out a personal system for preventing an inadvertent gear-up landing.

Some experts say that strict adherence to the checklist will stop this stupid maneuver. However, we could devote a page to the two words "gear down" but it won't prevent one accident unless somebody looks at it. So let's be realistic for a minute—we know that all pilots don't use check lists before landing, and what's more, we have little hope of insuring that they will. In fact, in a single-seat bird, just where do you whip out your list and read the magic words "gear down"? On an overhead pattern you may have 5-30 seconds on downwind, so where do you refer to the checklist? Anyway, by this time you've done just about everything but gear and flaps. How could anybody forget one or two items before touchdown? Evidently it's not too tough, because we just can't seem to eliminate a mental lapse that comes over a pilot now and then.

For example:

• After a series of touch-and-gos, the T-29 pilots realized they were about to land sans gear. They applied power and made it around —almost. On postflight the crew chief found a bent prop.

• A fighter pilot made a series of touch-and-go landings. Gear check was called, but he managed to look somewhere besides at the gear indicators. He slid to a stop 4000 feet down the runway.

• An O-2 pilot *and* copilot were distracted by another aircraft flying an erratic traffic pattern. They put the handle down but failed to recheck their indicators.

• The pilot of an A-37 put the gear handle down but *not all the way* down. The gear was about one-third extended at touchdown.

• Several embarrassed cargo type drivers found out that the gear horn system doesn't guarantee immunity from a gear-up landing. In one case, the handle had been placed in the "down" but somehow or other it managed to work its way back "up". Unfortunately, the warning system in this particular type bird won't activate until the power is reduced for touchdown.

• Another pilot retracted the gear after becoming airborne but then elected to abort because a hatch came open. He retarded the throttle for the abort but neglected to put the gear back down.

So what does all this mean to you as a guy who is responsible for insuring the gear is in the proper position? First of all, it seems that one of the most likely situations which leads to a gear-up landing is in the touch-and-go traffic pattern. "After five or six landings, the pilot acknowledged the gear down and checked and proceeded to land gear up." For some reason, we get complacent doing this sort of thing and anything can happen when complacency sneaks in.

If there was some method of building a black box that would warn a pilot when his habit pattern was broken we might take a step in the direction of preventing "gear-ups." *Anytime* you deviate from the "usual way" of flying your pattern, BEWARE. "Extend your downwind for spacing," "Do a 360° to the right (from the GCA pattern controller)", "Delay your break, aircraft on the runway," "Continue your pattern, but be prepared for a go-around," "Holding at the gear." All these remarks should trip a warning signal in your brain that you had better be extra careful to insure everything is re-re-checked before you cross the threshold!

Although it is not specifically in their job description, the tower operators have done a fine job in averting this embarrassing maneuver. They saved 21 gear-ups in CY 1971. Nice going, but the crew can't depend upon anybody but themselves. Tower operators, too, should be especially alert when they direct a pilot to alter his pattern.

The only guy who can prevent a gear-up landing is the guy who can reach the gear handle. All the warning systems, RSU, and tower operators combined can't reach it. The problem is in the cockpit and you are the one who'll have to face the music—so keep your head out and get the gear down. ★

THRUST REQUIRED CURVES

28(7)

A clear understanding of the relationship between thrust required and airspeed is important for safe flight in any jet aircraft. Particular attention to thrust requirements is essential in the F-111 because of its variable sweep wing, sharp drag rise at high angles of attack (typical of aircraft with high wing loading), relatively slow thrust buildup during engine acceleration, and because of the nature of the flight control system.

Figure 1 shows how thrust required and thrust available change at different airspeeds for a typical F-111 configuration and gross weight. Thrust required can be defined as the amount of thrust you need to sustain your present airspeed, altitude and g. The pilot must be aware of the rapid drag rise, or increase in thrust requirement that exists at higher angles of attack in the F-111. Occurring over a very small range of airspeeds, this drag rise (the steep slope of the left side of the thrust required curve in Fig. 1) can lead to loss of control unless the pilot recognizes it, and makes timely corrections.

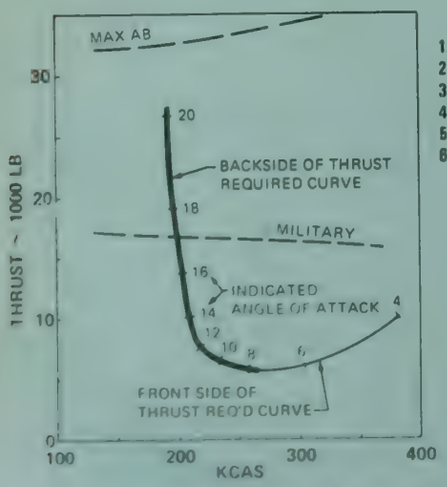


Figure 1. THRUST REQUIRED CURVE

In Figure 1, the thrust required curve has been drawn as a heavy line to the left of the lowest point and a light line to the right of the lowest point. These two parts of the thrust required curve will be considered separately, because the aircraft behaves differently on each part. The heavy-lined portion is commonly known as "the backside of the thrust required curve" or "the backside of the curve." For lack of a better name, we will refer to the light portion as "the frontside of the curve."

Note that as airspeed decreases during flight on the frontside of the curve, less thrust is required for steady one-g flight. On the backside of the curve the opposite is true: it takes more thrust to fly slower.

Changes in thrust, g, airspeed, gross weight and configuration affect the flying qualities of the F-111 at high angles of attack. Each of these changes will now be discussed separately.

EFFECT OF THRUST CHANGES

Most of the time, aircraft are flown on the frontside of the curve where it takes more thrust to fly faster and less to fly slower. When thrust reductions are made on the frontside of the curve, the aircraft slows down until it reaches a new speed at which thrust required equals the new thrust which the pilot has selected.

On the backside of the curve, however, this is not true. Thrust reductions on the backside of the curve are divergent—that is, once thrust is reduced, speed will begin to reduce and, unless a correction is made, never stabilize at a lower speed. The reason for this may be seen in Figure 1. Choose a point on the backside of the curve, and imagine that you're flying there in 1 g stabilized conditions. Now reduce thrust slightly. The aircraft begins to slow down, but at the slower

speed even more thrust is required, so you slow down even faster. The aircraft will continue to decelerate until control is lost or until a correction is made.

EFFECT OF SPEED CHANGES

A similar result can also be produced by a decrease in speed at constant thrust. If, for example, speed falls off slightly due to atmospheric disturbances (gust, turbulence, etc.) during flight on the frontside of the curve, airspeed will eventually rebuild and stabilize at its initial value.

On the backside of the curve, thrust will be insufficient at the lower speed, and speed will continue to decrease until a correction is made or control is lost.

EFFECT OF g

An understanding of the effect of g on thrust required may be obtained by referring to Figure 2 and considering the following example. Curve A in Figure 2 is for one g flight. Curve B is for 1.5 g flight. Pick a point on Curve A and assume that you are flying there in one-g level flight. You then roll into a level 1½g turn at the same airspeed. By so doing, you have jumped straight up from Curve A to Curve B on Figure 2. You can see from Figure 2 that at lower speeds the increase in thrust requirements can be very big (the longer arrows on the left side of Figure 2). Also, at any speed, pulling g can place you on the back side of the curve. At higher speeds, it will take more g to get you there but it can still be done if you pull hard enough.

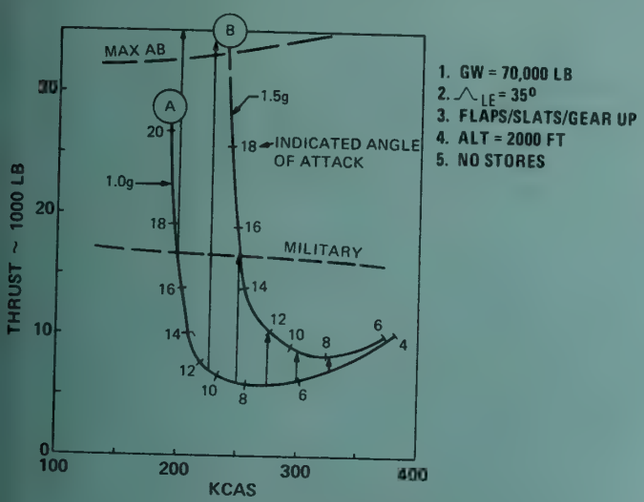


Figure 2 EFFECT OF g ON THRUST REQUIRED

EFFECT OF GROSS WEIGHT

The effect of gross weight upon thrust requirements is similar to the effect of g, in that pulling 2g is the same as doubling the weight of the aircraft. Figure 3 shows two curves. Curve A represents the same conditions as Figure 1 (70,000 pound aircraft) and Curve B represents an 80,000 pound aircraft. Note that for the heavier aircraft, the backside of the curve extends to a higher airspeed; therefore, when flying a heavy aircraft, particular attention must be paid to angle of attack in order to avoid inadvertent flight on the backside of the curve.

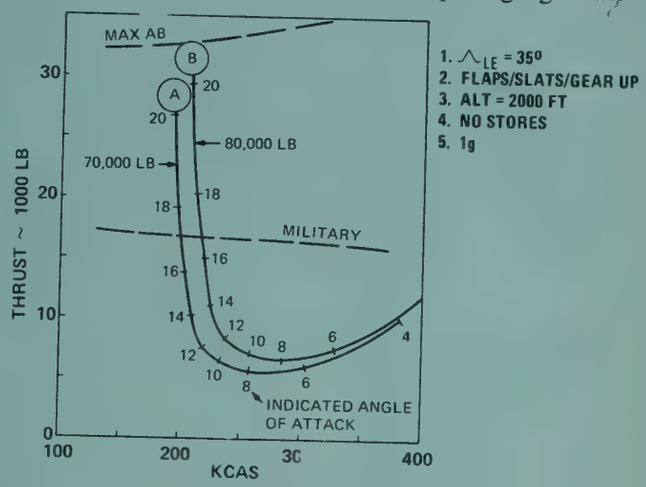


Figure 3 EFFECT OF GROSS WEIGHT ON THRUST REQUIRED

EFFECT OF FLAPS AND SLATS

Figure 4 shows two thrust required curves. Curve A is for the aircraft with flaps and slats retracted, and Curve B is for the aircraft with flaps and slats extended.

Note that the slope of the backside of the curve is more gradual with flaps and slats extended; hence, drag and angle of attack buildup will be easier to detect and control.

Figure 4 also shows that if extension of flaps and

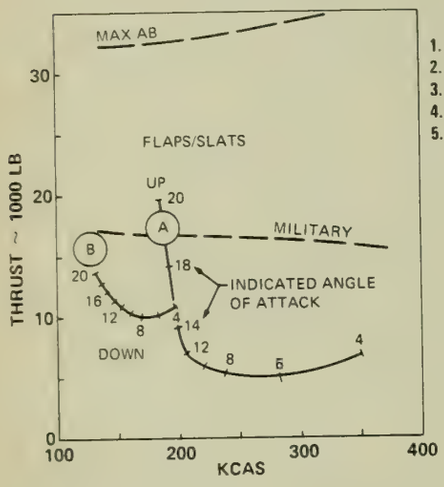


Figure 4 EFFECT OF FLAPS AND SLATS ON THRUST REQUIRED

slats is delayed during decelerating flight, the clean aircraft will reach the steep backside of the power curve at a much higher airspeed than it would if flaps and slats were extended.

It is most important to remember that any delay in selection of flaps and slats can be critical during decelerating flight.

EFFECT OF WING SWEEP

Figure 5 shows thrust required curves for 16, 26, 35, 50 and 72.5 degrees wing sweep. Note that although the slope is more gradual at wing sweeps aft of 35°,

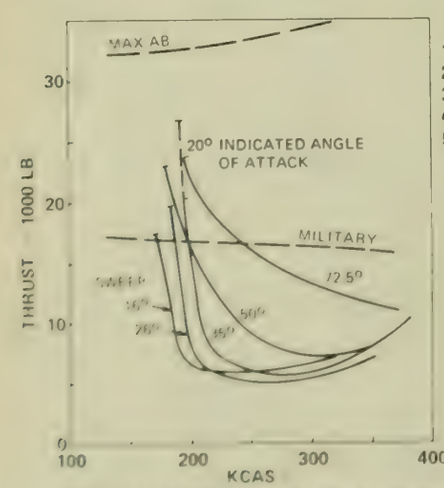


Figure 5 EFFECT OF WING SWEEP ON THRUST REQUIRED

the backside of the thrust required curve extends to higher airspeeds at aft wing sweeps.

An important effect of wing sweep is that if wings are inadvertently left aft of 26 degrees, flaps and slats cannot be extended. This may place the aircraft at a critical airspeed in the clean configuration, and unless immediate corrections are made, thrust required may exceed thrust available.

FLIGHT CONTROL SYSTEM EFFECTS

In most aircraft when you slow down at constant g you have to trim nose up or hold in back stick. This trim change or stick force change is an indication to the pilot that speed has been lost. In the F-111 during decelerating flight at constant g, command augmentation will produce additional elevator deflection with no pilot input. As a result, in the F-111, stick force and trim change are not available to tell the pilot that speed is being lost. The F-111 pilot has to refer to his flight instruments, particularly during decelerating flight at lower airspeeds, and must control angle of attack to avoid inadvertent flight on the backside of the curve.

CORRECTIONS

There are four types of corrections that can be made to prevent loss of speed due to insufficient thrust on the backside of the curve:

1. Increase thrust
2. Reduce g
3. Lower the nose to trade altitude for airspeed
4. Change configuration.

It is important to realize that compensation for insufficient thrust must be made immediately or thrust required may quickly exceed maximum thrust available. If this happens, and if the configuration cannot be changed by lowering flaps and slats, only two possible corrections remain: Reduce g or decrease altitude. If the aircraft is already at minimum g and altitude, no recovery is possible.

USE OF ANGLE OF ATTACK

From this discussion, it may be seen that the key to avoiding inadvertent flight on the backside of the power curve is control of angle of attack. Examination of the thrust required curves (Figures 1 through 4) shows that by controlling angle of attack, the pilot can compensate for variations in wing sweep, g loading and gross weight, and can readily maintain a safe margin. ★

(General Dynamics *111 Flyer*)



PSYCHED?

The mission was a T-33 ferry trip to the west coast. The pilot had RON'd a couple of hours away from destination. After takeoff on the last leg of the trip, climbing through 3000 feet, the tach went to zero. The engine operated normally and all other instruments indicated properly.

Rather than press on to destination, the pilot elected to stay VFR in the local area to burn off fuel and land. He advised tower and departure control of his problem and his intentions.

After about 20 minutes of flight, the pilot requested a downwind entry and declared an emergency because of his tach problem. About two minutes later he reported on downwind and was cleared to land. Weather at the time was visibility two miles in blowing dust, wind down the runway at 20 gusting to 26.

The pilot called base leg with three green and pressure, and was again cleared to land. He again reported three green with pressure, and tower once more cleared him to land, this time on guard channel. The guard transmission blocked out the pilot's third base leg call, but he subsequently acknowledged his clearance.

When the aircraft was on final, the mobile control officer saw through binoculars that the gear was up and made two transmissions on guard channel advising the T-33 on final to go around. When the T-Bird approached the overrun, mobile fired a red flare, and when the aircraft came over the threshold, mobile fired a second flare.

Personnel in mobile control were convinced the airplane was going to belly in—and they were right, to a point. The bird made contact with the runway, damaging the inboard fairing section of both flaps, grinding down the speed brakes and the main gear doors, scratching the underside of the fuselage and breaking the rotating beacon lens cover.

A go-around was initiated at or shortly before runway contact. The aircraft gained a small amount of altitude, and witnesses observed the gear extending. The pilot evidently felt the acceleration was insufficient for a successful go-around; he transmitted "Going to belly in" on tower frequency, then greased it on, about 4500 feet down the runway, with all three wheels down and locked!

Now the plot gets devious: According to the pilot's statement, on downwind he had all indications of three down and locked, no red light, no horn, normal hydraulic pressure and had performed a "jiggle check." He also stated that he did not hear mobile's transmissions on guard, see either of the red flares or hear the gear warning horn at any time during the approach and landing. He stated further that he did not touch the gear handle after making the "jiggle check" on downwind, that he started his go-around because he sensed that he was too low, and that he hadn't touched the gear handle after initiating go-around because there was insufficient time to do so. (Actually, there was about 20 seconds available; gear extension time is approximately six seconds.)

The airplane was jacked up and the gear was cycled six times. No malfunctions noted. Indicators, light and warning horn checked good. Radios ground checked okay. A continuity check indicated no stray voltage.

What's the real story? Your guess is as good as ours. The best guess we've heard thus far follows the line of reasoning that, preoccupied with an emergency situation, making a pattern entry other than the standard overheard, and faced with deteriorating weather in the form of blowing dust and gusty winds, the pilot's normal habit patterns may have been interrupted. Following this line, he may have placed the gear down, received proper indications, then retracted the gear at that position where he normally would extend it. Tripping further on down that highly speculative path, when the pilot realized he was closer to the runway than normal, he may have initiated his go-around and, instinctively reaching for the gear handle, placed the gear handle down.

Think it couldn't happen? Reflect, for a moment, on some of the dumb things *you've* done in an airplane while preoccupied with something else. (If you've never done anything dumb in an airplane, talk to one of the older heads or wait until you've had some more experience.)

Any emergency brings distractions. It is a time for cool-headed analysis; for fast—but never hasty—action; for checking and double-checking all the matter-of-course things the omission of which can compound problems many times over.

Think. Act. Check and double check. And don't settle for anything less than control of the situation. ★



REX CROSS

tions about arrival and departure problems. I say something like, "How come we had to hold at the end of the runway for 30 minutes before cleared for takeoff?" Answer, "Well, we've always had a problem here with Center. Thirty minutes is not too bad; some days it's longer." This was hard to accept so we checked with Center. To make a long story short, Center would be happy to discuss the problem and were sure the delays could be reduced. It just so happened that no one bothered to talk to them about it. Sound familiar?

PROGRESS. We know of one base which, after identifying some critical problems in the transient service area, has really gone all out. New paint in Ops, modern snack bar—a real "let's all get together and make this base Number One" attitude. They have a long way to go, but I bet they make it.

APPROACHES AND DEPARTURES. It seems to me that over the years we're developing some rather standard answers to ques-

IT HAPPENED THE OTHER DAY and it's bad business. Fortunately, it wasn't a critical flight item. A pilot on a not-too critical Ops

RILEY'S

COUNTRY NOTES

876-2633 AUTOVON

flight ordered a transient maintenance type to perform some work on his airplane even though the TA troop had no tech data! The data was available, but the pilot would have had to wait about 45 minutes. I wonder if he would have waited had it been a more important item? If you have a maintenance problem, stay out of the working troops' way and let them do it—right.

BELIEVE IT OR NOT we still have a bunch of recip birds flying around. One thing that they are noted for is a healthy appetite for oil. Unfortunately oil trucks are not always available and as a result the crew chief ends up with cases of quart cans pouring one at a time into a 50 gallon reservoir. There's got to be a better way.

TRANSIENT QUESTIONNAIRES. One of the first things I look for when I arrive at Base Ops is the transient questionnaire. If they are not readily available I begin to suspect that no one really cares what the transient crew thinks about their facility. It was a real pleasure the other day when the dispatcher politely asked for my completed questionnaire. When I gave it to him he remarked, "After all, if we don't know what's wrong we can't correct it." How true! !

NCOs. An irritated pilot doesn't need too much coaxing to drop me a line or even pick up the phone. However, I don't hear from nearly enough of you enlisted guys who are plagued with greasy spoons, poor quarters, and lousy support. Let me hear from you—the program is for *all traveling troops.*

APPROACH PROCEDURES. One of the most frustrating phases of flying is the delay involved in getting on the ground. After a two-hour flight at altitude you begin your descent. From that time on, it will take at least another 30 minutes before touchdown, unless a great deal of coordination has taken place among Center, Approach Control and Ops. Take a good look at the approach procedures at your base. Is there any way to expedite traffic? That gas we use milling around out there doesn't come free. Imagine how many bucks we could save if we reduced every sortie by two minutes in the approach pattern. ★



REX RILEY

Transient Services Award

LORING AFB	Limestone, Me.
McCLELLAN AFB	Sacramento, Calif.
MAXWELL AFB	Montgomery, Ala.
HAMILTON AFB	Ignacio, Calif.
SCOTT AFB	Belleville, Ill.
RAMEY AFB	Puerto Rico
McCHORD AFB	Tacoma, Wash.
MYRTLE BEACH AFB	Myrtle Beach, S.C.
EGLIN AFB	Valparaiso, Fla.
FORBES AFB	Topeka, Kans.
MATHER AFB	Sacramento, Calif.
LAJES FIELD	Azores
SHEPPARD AFB	Wichita Falls, Tex.
MARCH AFB	Riverside, Calif.
GRISSOM AFB	Peru, Ind.
CANNON AFB	Clovis, N.M.
LUKE AFB	Phoenix, Ariz.
RANDOLPH AFB	San Antonio, Tex.
ROBINS AFB	Warner Robins, Ga.
TINKER AFB	Oklahoma City, Okla.
HILL AFB	Ogden, Utah
YOKOTA AB	Japan
SEYMOUR JOHNSON AFB	Goldsboro, N.C.
ENGLAND AFB	Alexandria, La.
KADENA AB	Okinawa
ELMENDORF AFB	Alaska
PETERSON FIELD	Colorado Springs, Colo.
RAMSTEIN AB	Germany
SHAW AFB	Sumter, S.C.
LITTLE ROCK AFB	Jacksonville, Ark.
TORREJON AB	Spain
TYNDALL AFB	Panama City, Fla.
OFFUTT AFB	Omaha, Nebr.
McCONNELL AFB	Wichita, Kans.
NORTON AFB	San Bernardino, Calif.
BARKSDALE AFB	Shreveport, La.
KIRTLAND AFB	Albuquerque, N.M.
BUCKLEY ANG BASE	Aurora, Colo.
RICHARDS-GEBAUR AFB	Grandview, Mo.
RAF MILDENHALL	U.K.

THE IFC APPROACH

By the USAF INSTRUMENT FLIGHT CENTER
Randolph AFB, Texas, 78148

On 1 May 1972 the USAF Instrument Flight Center (IFC) was established at Randolph AFB, Texas. The Instrument Pilot Instructor School is now one division within the IFC and retains the instructor/flight examiner training function. The Flight Standards Division will concentrate on the regulatory aspect of flight and assist HQ USAF in the development of directives, regulations, manuals, and instrument procedure criteria. The Research and Development Division will continue to participate in the development of the advanced instrument systems, displays, and cockpit procedures.

The Instrument Flight Center will provide a single organization responsive to the training requirements for IFR flight, the directives and publications which govern IFR flight, and the instrument systems which make that flight possible. The goal of the Instrument Flight Center remains the continual improvement of the all-weather capability of the Air Force and the continual reduction in aircraft accidents attributable to instrument-related factors.

TRY THIS QUIZ

1. At what point during a precision approach should you begin looking for the runway environment?

A. At DH, and execute a missed approach if the runway environment is not in sight.

B. Prior to DH, and execute a missed approach at DH if the runway environment is not in sight.

Although covered many times in the past, IFR experience reveals that pilots frequently misunderstand the DH concept. Decision Height is the *lowest altitude* at which a missed approach will be initiated if sufficient visual reference with the runway environment has not been established. Consider DH as the point at which visual assessment of the landing situation must be completed. Therefore, you, the jock, should be performing a systematic scan for the runway environment in your instrument cross-check prior to DH and be ready to execute the missed approach at that altitude. Your correct response should have been B.

2. During a non-precision approach, where should you plan to arrive at the MDA?

A. Prior to the missed approach point.

B. At the missed approach point.

According to the definition of Minimum Descent Altitude (MDA), the pilot will not descend below this specified altitude until visual reference has been established with the runway environment and the aircraft is in a position to execute a normal landing. The Missed Approach Point (MAP) is located along the final approach course at MDA and, according to TERPs, not farther from the final approach fix than the runway threshold or over an on-airport navigational facility. Should you elect to arrive at the MDA and MAP simultaneously, your aircraft will most likely be in a poor position to execute a safe landing. The only solution is to plan your descent to arrive at MDA prior to the MAP and allow for maneuvering to a normal landing approach. The correct response to this question is A.

One of the culprits in developing poor habit patterns is the pilot's failure to be aware of the MDA-MAP relationship during an instrument approach flown for practice. You cannot wait until the MAP to begin looking for the runway environment and expect to be able to make a normal landing. Instructors should make

this subject a main point during training sessions. For a detailed discussion of Missed Approach Points, refer to "IPIS Approach" May 1972.

3. You are executing a non-precision straight-in approach to North AFB and you note that PAR minimums are published in the minima block on your approach procedure. The PAR minimums indicate that:

A. Precision radar is available to you upon request.

B. Your approach is being monitored on the precision radar scope.

C. Both A and B are correct.

HQ USAF determined that an operational requirement existed for publication of PAR or ASR landing minima on high altitude non-radar instrument approach procedure charts. Where PAR serves the runway to which the non-radar approach is aligned and straight-in landing minima are published, only PAR information is required for that runway. Where only circling minima are published for the non-radar approach, either PAR or ASR minima may be depicted as required by the operational unit responsible for the procedure. The most complete source of radar minima information remains the IFR Supplement. Ref: Production Specifications for DOD FLIP Terminal High Altitude.

The pilot should know that the PAR minimums are published for his convenience. His non-precision approach may or may not be monitored on the PAR scopes, depending on situations such as local traffic agreements and equipment capability. A precision monitor of a non-precision approach may not be feasible due to final approach alignment. The only approach which can be monitored with any accuracy on a precision scope is an ILS where the center line and glide path are coincidental. The correct response to this question is A. ★

out of everything...except gas

The aero club pilot had filed a VFR flight plan from Travis AFB to Salt Lake City in a Cherokee 180. The first leg of the flight, to Reno, Nevada, was uneventful —weather VMC and no problems. Approaching Reno, however, he had to divert north to avoid an area of cumulus clouds. He passed the clouds, then turned back south toward course, but was confronted with another cumulus area near Reno. Reno FSS reported a 3000 foot ceiling in rain, and the pilot diverted once more to the north.

After passing the weather he swung the Sparks NDB, with the Reno VOR showing him left of course. In the vicinity of Pyramid Lake the layered clouds became a broken condition, and he descended to 7500 feet (about 3000 feet AGL) and began flying "up the valley looking for a VFR route east." After flying up the valley for 20 minutes he spotted an opening in the clouds and circled upward, leveling at 11,500 feet. He tried to get a VOR lock on Lovelock, Hazen and Reno; all were unsuccessful (Hazen VORTAC is notamed "VOR unusable" in the IFR Supplement). He attempted voice contact with both Elko and Reno FSS, with no success. He then decided to descend and navigate by map reading. He descended and climbed repeatedly for the next hour, dodging clouds; then noted that he was down to five gallons of fuel in his left tank and switched to the full right tank.

About 20 minutes later he br[illegible] into the clear, but was unable to locate his [illegible]'e tried unsuccessfully to contact FSS, then [illegible] find a ranch and land, to "obtain fuel." R[illegible] [illegible]ountain he found a ranch with a large meadow adja[illegible] He made a low pass and saw that the meadow wa[illegible]et and contained numerous cattle, but found a dirt [illegible]ad which seemed to offer a safe landing site.

On short final approach the pilot saw large rocks along the fence next to the road and applied power to go around, but his power application was too late and he touched down. He then pulled off power and continued the landing.

On landing roll the left main gear struck a large rock and sheared off at the wing attach points. Unhurt, the pilot climbed out, walked to the ranch, called FSS to close his flight plan, then called the aero club at home base to break the bad news.

The series of mistakes leading to that rocky backroad included:

- Attempting radio navigation below minimum reception altitude.
- Failure to use basic map-reading techniques (the landing site was 45 degrees off course, 85 NM north).
- Improper fuel monitoring (at landing, the aircraft contained about 22 gallons of fuel—well over two hours at cruise power). ★

UNITED STA

1971 Safety Trophies

Secretary of the Air Force Safety Trophy



AIR TRAINING COMMAND

Best overall accident prevention program of all commands with 200,000 or more flying hours per calendar year.

ATC's effective accident prevention program reduced the command's flight accident rate by 53 percent to a record low and produced a zero explosives accident rate. The accomplishment of Air Training Command contributed significantly to the all-time low flight accident rate achieved by the U. S. Air Force in 1971.

USAF SOUTHERN COMMAND

Best overall accident prevention program of all commands with less than 200,000 flying hours per calendar year.

The zero major and minor flight accident rates and marked improvements in explosives and ground safety reflect the aggressive accident prevention program developed by USAFSO. In view of the primitive nature and attendant hazards of the operational environment, these accomplishments were exceptionally commendable.

Koren Kolligian, Jr., Trophy

CAPT RAYMOND M. ROSS



The Koren Kolligian, Jr. Trophy is awarded to Captain Raymond M. Ross in recognition of his professional skills in coping with a serious inflight emergency.

During a night combat strike mission, on 19 March 1971, two surface-to-air missiles detonated close to his F-4, inflicting serious damage to the aircraft. The utility hydraulic system and one primary flight control system were disabled. Since friendly forces were known to be in the area, Captain Ross withheld jettison of his bomb load until over open ocean. Despite increased aircraft control difficulties encountered after the landing gear was lowered by emergency methods, he made a successful approach-end barrier engagement at his recovery base.

★★★★★

Maj Gen Benjamin D. Memorial Awa

PACIFIC AIR



Presented to the major the most effective aircraf tion program for the prec

Strong leadership and professionalism among air personnel produced a rec craft accident rate of 3 improvement. This was a the command was flying n lion hours under the hig mental conditions of comb and marginal facilities.

Chief of Staff Individual Safety Trophy



MAJ ROBERT J. PEISHER

As Chief, Safety Educa-
on Division, HQ SAC,
ajor Peisher established
e SAC Safety Hotline, a
ommand-wide automatic
cording communications
stem for identifying and
rrecting serious safety
oblems. Under his guid-
ce **Combat Crew** maga-
ne disseminated timely
cident prevention infor-
ation. These contribu-
ns reflect Major Peish-
's dedication and pro-
ctivity in the safety
ld.

MAJ CARROLL L. WRIGHT

Major Wright directed and supervised all flying, ground and explosives safety programs as Chief of Safety, 40th Aerospace Rescue and Recovery Wing. The outstanding safety program he initiated and managed contributed immeasurably to the rescue mission of HQ 40th ARRW and 13 subordinate units in seven countries in the European theater.

TSGT WILLIAM H. WEAVER

Sergeant Weaver, a Safety Technician for the 15th Air Base Wing, Hickam AFB, Hawaii, produced significant improvements in traffic and water sport safety. He developed a slide presentation, "Weaver Bird," that has been acclaimed in both the civilian and military communities for its educational importance in stressing defensive driving.

MRS ARLENE M. SIMS

Mrs Sims, safety monitor for the Engine Division, Oklahoma City Air Materiel Area, developed a four-point program that effectively improved safety in the working environment for more than 1800 employees. The significance of her achievements was reflected by a 67 percent reduction in disabling injuries.

Colombian Trophy



366TH TACTICAL FIGHTER WING

The Colombian Trophy, symbolic of excellence in military aviation safety, is awarded to the 366th Tactical Fighter Wing, APO San Francisco 96337. The wing, equipped with F-4 aircraft, flew more than 15,000 sorties in 30,000 hours without an accident. In setting this record, the wing overcame such hazards as extreme weather, a hostile combat environment and operations where the midair collision potential is unmatched anywhere in the world.

JACKING, LEVELING and WEIGHING THE A-7

D. H. BRAZELTON
Maintainability Engineering Specialist

Recent comments from the field brought about a comprehensive study of jacking and weighing procedures for all A-7 airplanes. Problems had been cited that involved inaccurate CG determinations, leaning jacks, and aircraft falling off jacks. The electronic weighing equipment used in the field appeared to be the key.

A series of weighings was performed with Vought Aeronautics Corporation's floor scales, electronic scales, and combinations of the two. Weighings were also made with the Mobile Electronic Weighing System (MEWS). Care was taken to evaluate the problems noted in service and to review existing procedures.

The results of this testing showed that the aircraft can be weighed satisfactorily on electronic scales (types C-1 and C-2) if the following precautions are observed:

1. The electronic weighing kit must be calibrated and *accurate*.

2. The airplane must be leveled *prior* to engaging the fuselage jack.

3. The airplane must stay level during jacking.

The first condition will have to be satisfied by the friendly troops at PMEL. The folks at Organizational Level can help a great deal by proper handling, storage, and use of the equipment. If the kit has accidentally been mistreated, it must be rechecked for accuracy. Otherwise some pretty wild CG calculations can result.

The second and third precautions are procedural. To assist in this area, the instructions for jacking and for weighing have been rearranged, clarified, and published as a special paragraph in the manual. These are now found in Change 7, dated 15 January 1972, to TO 1A-7D-2-1.

If these are understood and followed, the Maintenance Officer's ulcer will be reduced, along with the per capita consumption of fingernails among jacking crews. The logic of the procedure becomes clear if we understand what goes on when the airplane attitude is changed.

The first view in the illustration shows the A-7 at rest, on its wheels, on the ground. Identification of a few important locations and dimensions is necessary. First, the fuselage and wing jackpoints are shown as points A and B, respectively. A direct line between the two is line AB with a length L. One thing that can be depended on is the fact that length L will not change, regardless of how we move the airplane. The weight of the airplane is always vertical to the level ground, so it will have a "footprint" represented by length W if it is on its wheels or line CD if it is on jacks.

Let's ignore length W for the moment and look at the second view. If the airplane is supported at points A and B and then leveled by lifting point B, the angle of AB increases and the "footprint" gets smaller. The jacks then have to slide or lean to adjust to the new position. Not only is this hard on the nervous system, it can foul up the measurement of the reaction points and build errors into the CG caluculation.

So the trick is to get the airplane level without tipping the jacks. The procedures in the manual provide two methods. Either is good, and both involve leveling the airplane before it is elevated on all three jacks. How these methods work is simple. By leaving the nose or both main wheels free to roll while leveling, points A and B are allowed to move as needed. In view 2 of the illustration, this is accomplished by jacking the wings first. When level, position the fuselage jack and continue the jacking—being careful to maintain the level condition as the airplane is raised.

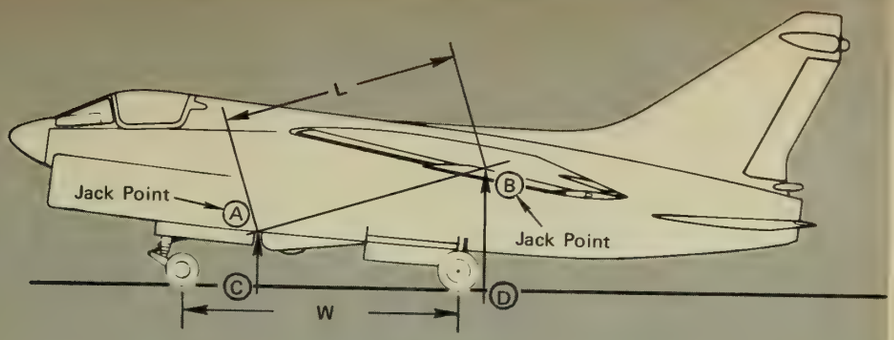
View 3 shows the other method of leveling. Roll the airplane onto skid plates and level by deflating the nose gear strut and inflating the mains. All three wheels are free to roll as "footprint" W changes its length. If the airplane shows a tendency to swap sides of the hangar while you are doing this, a chock at the nosewheel will stop it and the mains will do all the adjusting. Once level, the jacks can be set and the airplane lifted—again remembering to maintain levelness.

How about a few hints to make the job a little smoother?

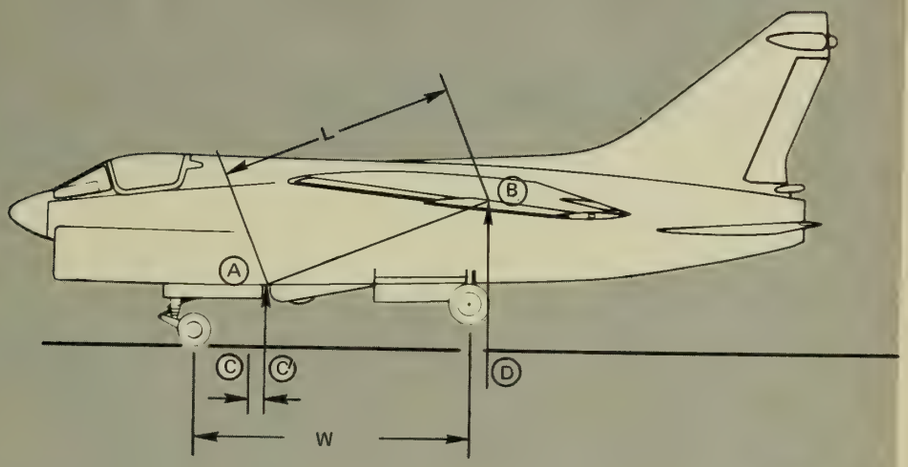
1. Level the airplane laterally as well as longitudinally. This will keep side-to-side loads off the wing jacks.

2. Tie the nose wheel strut so it can't extend after leveling and the amount of jacking to get clear of the floor will be reduced. (If you use the leveling method shown in view 2, you can deflate the nose strut after the fuselage jack is engaged.)

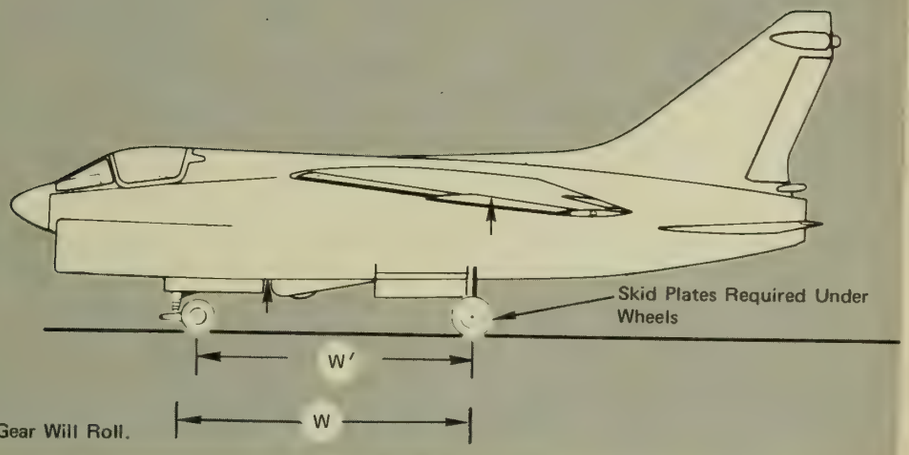
3. It's important to keep the plane level as you jack. Rather than trying to jack continuously, stop about every inch or so to make necessary adjustments. This way,



Airplane at Rest



Airplane Leveled Using Wing Jacks
Note Rearward Motion
Of Fuselage Jack Point
(C–C)



Airplane Leveled by Inflating
Main Gear Struts and Deflating
Nose Gear Strut. Note That
Nose Wheel Rolls from Angular
Change During Deflation. If
Nose Wheel Is Restrained, Main Gear Will Roll.

errors caused by differences in personnel or jack condition can be corrected before they become too severe.

4. Read the latest change to your -2-1 manual. It's all in there under the heading "Jacking Airplane for Weighing."

In addition to all of this, the Air Force is discussing a larger jack pad. If it comes into being, it will in no way eliminate the necessity for using extreme care in leveling the airplane, in placing the jacks squarely under the jack pads, or in holding that level as you lift the airplane from the floor. In short, the procedures given in the manual are important. To quote out of context a message from 12th Air Force, "—the A-7D aircraft can be safely weighed if all prescribed directives are strictly adhered to—"

This means—leaners count only in horseshoes. ★

(Reprinted from *VAC Field Service Maintenance Digest*)

Ops topics

GROUND CHECKED OKAY!

The C-141 flight engineer was checking the aircraft's flight controls, using the Nr 2 hydraulic system, when the low pressure light for Nr 1 system went out. The FE suspected that pressure from Nr 2 system was somehow escaping into Nr 1 system.

He called Maintenance personnel, who came out to the aircraft and checked the system several times. Finally the symptom disappeared, and they cleared the write-up with the explanation that the Nr 1 system had contained air, which eventually bled out.

After starting Nr 1 and Nr 2 engines, the crew checked the flight controls. No problems. With all four engines running, the crew again checked flight controls. Ops normal. During the final check before takeoff, the crew checked the flight controls once more. This time the control column stuck in the aft position, and could not be moved forward, even after engine shutdown!

Maintenance investigation revealed the Nr 1 system linear actuator was frozen. The elevator control pack was removed and replaced.

A little suspicion can promote prolonged good health!

P-40 "WARHAWK" PILOTS
ASSOCIATION
1ST ANNUAL REUNION
IMPERIAL HOUSE, NORTH
DAYTON, OHIO
SEPTEMBER 15, 16, 17, 1972

For Information Contact:
Herbert O. Fisher, President
Port Authority of NY and NJ
111 Eighth Avenue (Room 1409)
Telephone (212) 620-8396

TARGET—12 O'CLOCK LEVEL

Aircraft operating within the United States—both military and civil—are prohibited from flying below 10,000 feet at an indicated airspeed above 250 knots. This restriction does not apply, of course, if the minimum safe operating speed is greater than 250 knots.

In addition, the 250-knot limit has been waived for military aircraft operating along high-speed, low-level routes whenever high speed operations are necessary to the accomplishment of operational and training requirements.

Recent reports of near midair collisions involving USAF Aircraft on low-level training missions and general aviation aircraft should serve to remind us of the need to be extraordinarily vigilant while operating in these "high threat" areas.

A review of the near miss reports reveals that many military pilots are under the misconception that civil aircraft have an obligation to remain clear of these low-level routes. This is not the case. There is no restriction on civil aircraft operating in these areas. In addition, the civil pilot tends to consider the airspace below 3000 feet AGL as his personal province (much as we consider PCA ours), and the last thing he expects to see is somebody coming at him at three times his redline speed.

A typical civil trainer cruises at 85 knots. A little reflection makes two conclusions rather obvious:

- In order for a midair to occur, we would just about have to be pointed at him; the reverse is not necessarily true.
- At his speed, even if he sees us, there is little that he can do. Evasion, therefore, is primarily up to us:

Maximum vigilance is a necessity. See and avoid!

YAY!

One of the factors helping to combat the alarming rise in gear up incidents/accidents is certainly the man in the tower. According to information recently released by Air Force Communications Service, controllers prevented 21 aircraft from making gear-up landings in 1971.

There are many factors which can contribute to a sliding arrival—and by now we've probably experi-

enced them all, in one form or another. Habit pattern interruption, the boredom of multiple approaches, distractions (both within the airplane and outside) . . . they've all taken their toll many times over. But one sterling, shining fact remains: in most cases, the gear isn't down because the pilot didn't put it down.

We learned long ago that people—even pilots—are only human, and that they will make mistakes. Given that certainty, the vigilance of tower operators, radar controllers and RSU supervisors will continue to be necessary to reduce the accidental potential of the gear-up landing.

BOO!

On the other hand, tower controllers are human, too, and sometimes don't do all they could to help.

On landing, the F-106 pilot pulled the drag chute handle and nothing happened. Shortly thereafter, tower advised the pilot that he had no chute, then commented that tower had observed something that *might* have been a drag chute fall from the aircraft about a mile and a half out on final.

Now he tells us!

FLIP CHANGES

Clearance Readback: There is no requirement that an ATC clearance be read back as an unsolicited or spontaneous action. Controllers may request that a clearance be read back whenever the complexity of the clearance or any other factors indicate a need. The pilot should read back the clearance if he feels the need for confirmation. He is also expected to request that the clearance be repeated or clarified if he does not understand it.

Hailstone Area: The National Hail Research Experiment (NHRE) will be conducted in northeastern Colorado during the period May through July 1972. Status of the HAILSTONE AREA may be obtained from the appropriate FSS or Denver ARTCC. See Special Notice and Procedures, Section II, under Colorado, FLIP Planning North and South America for details.

slide, herky, slide

The C-130 crew was out on a transition pilot upgrade mission, shooting a series of touch-and-goes. On downwind, the IP called a simulated engine fire in Nr 4. The pilot accomplished all emergency procedures for a simulated engine shutdown. As they rolled out on final, the IP called a simulated obstruction on the runway and the pilot made a three-engine go around, raising the gear and flaps as called for in the Dash-one.

Since the Nr 4 throttle was retarded, the gear warning horn was making one heck of a racket, so it was silenced.

(Aha! you say. Right you are!)

Downwind was extended to gain clearance on another airplane in the pattern which had called for a stop-and-go landing ahead of them. The first airplane stayed on the runway longer than expected, and the crew did not receive clearance to land until they were on short final.

The crew became aware of their "abnormal condition" at touchdown. When they realized that they had inadvertently become the world's largest bobsled, they aborted their touch-and-go and made it full stop.

Landing slide was a little more than 2700 feet. Miraculously, damage was restricted to friction damage only. No fire, and none of the propellers contacted the runway. Maintenance jacked up the aircraft, lowered the gear manually and towed the bird off the runway.

Ops topics

CONTINUED

TIPOFF

Shortly after takeoff the pilot depressed the external stores release button, located on the control stick, and both tip tanks jettisoned. As it turned out, the External Stores Release selector switch had been left in the ON position, rather than turned OFF, as called for in the pilot's preflight checklist.

Checklist discipline is such a simple thing; all it requires is the awareness that checklists are necessary and the willingness to comply with that necessity.

This useless waste cost us $9,000 in materiel. In other circumstances, as over a populated area, or in a situation where the fuel in those tanks is needed, the cost could be far more.

MAINTAIN AIRCRAFT CONTROL

Distraction is one of a pilot's worst enemies. It figures prominently in almost all instances of inadvertent gear-ups, and has played a major role in many loss-of-control mishaps.

Most recently, a student pilot in a T-41 was shooting a series of touch-and-go-landings. On touchdown, the pilot's window sprang open, the student released back pressure, the nose came down and the prop hit the runway. The student went around, recovering from the porpoise entry, and landed without further mishap.

Contributing to the incident was the fact that maintenance had not replaced the self-locking mechanism in the window, but the primary cause was simply that the pilot failed to control his aircraft.

The rule that's been with us for all these years still applies, and can't be emphasized too strongly: In the event of an emergency, maintain aircraft control; analyze the situation; and take proper corrective action. But the first rule is MAINTAIN AIRCRAFT CONTROL!

YES! NO? WELL, JUST MAYBE

"The path to misfortune is paved with opportunities to do the things you wanted—just a little later than you wanted to do them" (ancient Gaelic proverb).

Lead led the flight of two down the GCA final. As planned, on three-mile final Lead went around, leaving Two, a solo student, in position to complete the radar approach and land.

Meanwhile, tower had cleared another aircraft onto the runway for takeoff. Two was aware of the other aircraft, and assumed that the bird on the runway would be rolling in plenty of time.

It didn't work out that way, of course. At decision height (about three-fourths of a mile), Two transmitted that he was going missed approach.

Then the aircraft on the runway started to roll. Two pulled off his power and dived for the end of the runway. The RSU monitor directed a go-around on guard. The student noted airspeed dropping, selected burner and rotated to a landing attitude, but he couldn't prevent the crunching touchdown that followed. The aircraft hit the runway, then bounced high enough to stay airborne. The student pilot completed his go-around, flew a closed pattern with a low approach so that the RSU could check his gear, then flew a second closed pattern to a full stop landing.

A check of the gear after landing disclosed a ten-inch strip broken off the left main gear wheel rim and a bent right main wheel. And it's easy to imagine a hundred worse things that might have happened.

Once committed to a go-around or missed approach, there is only one prudent course of action, regardless of the temptation: continue the missed approach!

CONTROL LINE MODEL?

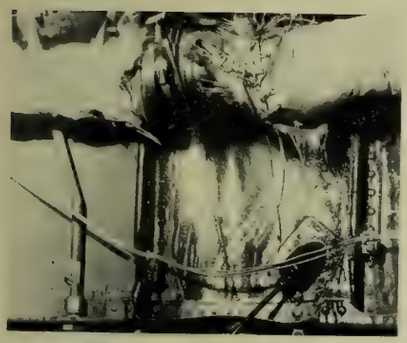
Transient Alert was busy, and the T-39 pilot was in a hurry. He decided to make a battery start while the copilot stood fire guard. The copilot pulled the chocks after the start, boarded the airplane and away they went.

Shortly after takeoff, ATC informed them that they had apparently taken off with a groundwire still attached, and they were requested to return to the departure base.

After landing they found the groundwire plug in the right wing receptacle. No sign of the clip, nor of the 25-50 feet of grounding cable, but they're pretty sure the hardware isn't on the airfield.

Aircrew members have been directed to use TA at enroute stops. Sounds reasonable.

CLAMP



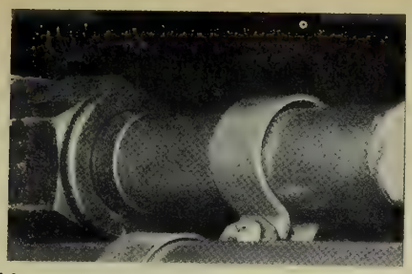
SENSE

As the saying goes, a chain is only as strong as its weakest link. This could also apply to aircraft system tubing and ducting, which are only as strong as their support or connecting clamps.

Clamps are used to support tubing throughout the aircraft. Improper installation or unserviceable clamps will allow vibration and chafing. Therefore, clamps should be inspected at regular intervals for correct positioning and condition of the liner and overall security condition of the clamp. Here's why:

Thirty minutes after takeoff the right hydraulic system on the KC-135 failed. The pump supply switches were closed and the mission continued. During postflight the forward support clamp on the Nr 4 engine strut hydraulic pressure line had chafed to the point of failure. A phase inspection had been completed the day before, but the individual who performed the look phase in this area failed to detect the chafed condition.

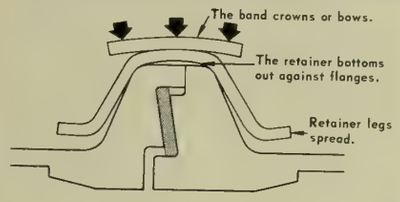
The V-Band clamp (coupling) is used in the utility system of some aircraft. The serviceable condition and proper installation of this type clamp is critical, for if a hot air leak should develop extensive damage can result. Example:



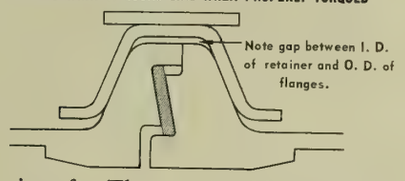
Unserviceable clamps such as this compromise system integrity.

THE EVILS OF OVER-TORQUING!

THIS IS WHAT HAPPENS WHEN A COUPLING IS OVER-TORQUED



HERE'S WHAT IT LOOKS LIKE WHEN PROPERLY TORQUED



An F-101 was returning from an IRAN facility. Just after takeoff from a transient base, at approximately 225 knots, the right engine fire light came on. The engine was shut down and the aircraft immediately returned to base. During maintenance at the IRAN facility, a V-Band clamp was improperly installed. The clamp came loose allowing 16th stage bleed air to escape into the engine compartment. The excessive heat damaged wire bundles and caused sheet metal warpage in the engine bay and keel skin. Also Nr 3 fuel cell was damaged by the heat and had to be replaced. Although the clamp was incorrectly installed, the supervisor failed to detect the improper installation even though no safety wire was installed as required by tech data.

Here are a few general rules that will prolong the life of the V-Band clamp and increase the reliability of the system in which it is used.

1. First, check the part number to insure that the correct clamp is being installed.

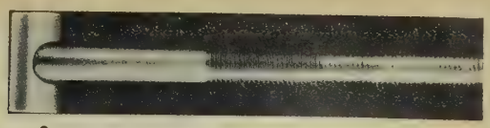
2. Inspect the clamp for twist or distortion. Inspect the V section for spreading at the open end. Check spot weld or rivets for condition and security. Check for cracks. Inspect the T bolt for galling or deformity. A clamp in poor condition should be replaced.

3. Exercise care during handling and installation.

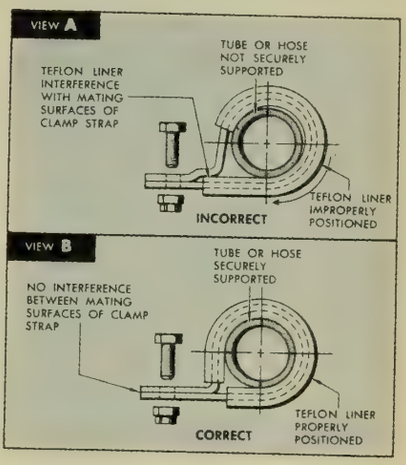
4. Clean the ducting flange mating faces of dirt, grease or corrosion. Use a clean cloth. Never use a wire brush on this surface.

5. Support the weight of the unit during mate up and installation of the clamp.

6. Properly align the mating flange. A poorly fitted joint requires excessive torque and will impose a structural load on the clamp which will cause premature failure. ★



Over torquing can also strip the T-bolt threads. Sometimes so slightly as to be invisible to the naked eye, but enough to cause coupling failure. If you know a coupling has been over-torqued, don't reuse it.



IF PARTICULAR attention is not paid to the position of Teflon covers on J79 (and other) tubing clamps, they may be installed incorrectly, as shown in view A of the illustration. This results in improper clamping, and the tube may not be gripped securely.

Be sure when installing clamps such as these that the cover is not caught between the mating parts of the clamp. View B shows the correct positioning of the cover. ✦

Tech topics

briefs for maintenance techs

C-130 CROSSED WIRES

While the C-130E was climbing through the 1200 feet after takeoff, the Nrs 3 and 4 turbine overheat lights began flashing. Those throttles were retarded and the lights went out. An emergency was declared and the aircraft returned to base.

A turbine section leak was found on Nr 4 engine, so the engine was removed and replaced. During trouble shooting of the turbine overheat warning system, crossed wires were found in the system. Several of the Nr 3 system wires were connected to the Nr 4 system and vice versa, causing both lights to illuminate when an overheat condition existed on either engine.

Review of the aircraft records did not reveal any maintenance on this system; therefore, it could not be determined when the wires were crossed, but is believed to have existed for a considerable time. Cockpit checks would appear normal because continuity was completed even though the system was miswired.

The lesson to be learned here is to use tech data, regardless of how well you know the system. Maintenance errors such as this, which could lead to two engines being shut down unnecessarily—or an engine not being shut down at all—could result in disaster.

TWO WRONGS

After a C-130 aborted takeoff because of low torque on Nr 1 engine, a bolt was found missing from the gimbal throttle pulley ring. This allowed the gimbal ring assembly to slip off the fuel control shaft.

Why was the bolt missing? Because the maintenance people who had worked on this item prior to the flight failed to install the bolt and the inspector didn't do his job! A careless mechanic and an indifferent inspector make a dangerous combination.

NO TORQUE

During scan of the engines on a KC-135 the copilot noticed what appeared to be a loose cowl fastener at the lower mid-section of Nr 4 engine.

Postflight inspection revealed no fasteners loose, but a hole was found burned through the cowl just aft of the surge bleed valve. The igniter plug, which was hanging by the igniter lead, had backed out. This allowed bleed air to escape through the plug hole, burning the cowl.

The aircraft records revealed that this plug and igniter lead had been replaced a couple of days previously. The plug was never torqued as required by tech data.

A maintenance shortcut (such as failure to properly torque an item) is a quick route to disaster. Just suppose that this hot air leak had been directed on fuel or hydraulic lines instead of the cowling skin. We could have been looking at a smoking hole in the ground instead of an incident report.

ALL POINTS BULLETIN

Subject known as Murphy last reported active at a modification facility where he caused wires in radio systems of a KC-135 to be reversed. Apparently reversal took place during TCTO 1C-KC-135-820 (windshield wiper) modification.

Murphy is frequently found in places where technical data are scarce, is seldom known to appear where all maintenance is completed IAW TOs. Subject is extremely dangerous; therefore, recommend vigilance by all personnel.

F-111 ENGINE DOOR SUPPORT

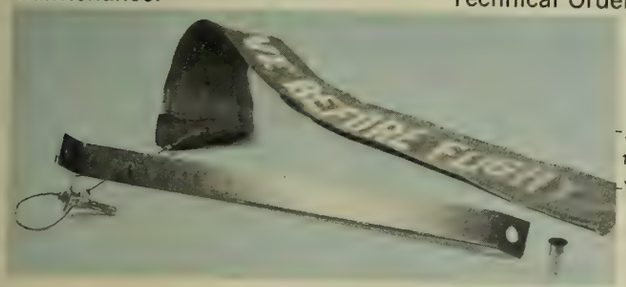
Tech Order 1F-111F-2CL-1 has a note that states, "The mid-engine access doors may be open during maintenance but they must be secured clear of the travel of the horizontal stabilizers."

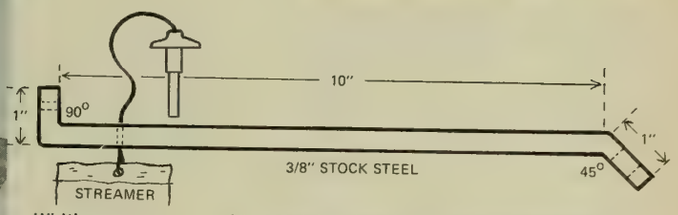
Sounds good; however, at present there are only two secure positions on these doors, either full open (which is in the path of travel of the stab) or full closed, making it impossible to conduct maintenance.

TSgt Ira H. Snuffer, Mountain Home AFB, Idaho, has come up with a suggestion which will correct this problem.

TSgt Snuffer has devised a door support bracket which will support these doors in the intermediate position, clear of the stabilizer travel and allow access to the engine area. Sergeant Snuffer's suggestion has been approved by TAC and SMAMA and will eventually be picked up in the Air Force Technical Order System.







Width	1"
Length overall	12"
Hole in 90° end	1/4"
Hole in 45° end	3/8"
Hole for cable	5/64"

Quick release pin P/N C1398C2C06D or any suitable substitute with a 1/4" shank no longer than 1".

Cable length 6"

SERVICEABLE ENGINE?

This F-4D was returning to base after completion of a strike mission when number two generator dropped off the line. A quick scan of the instruments indicated number two oil pressure going to zero. The engine was shut down and recovery to home base completed on one engine.

Number three main bearing scavenge hose was found ruptured. An unknown person at an unknown time had installed an unauthorized clamp. The bracket for securing this line during installation was missing and someone had used the unauthorized clamp to secure the scavenge line to an adjacent fuel line.

This unauthorized clamp allowed the scavenge line to chafe to the point of failure. This engine was received on base as serviceable and was installed in the aircraft without any inspection by the receiving unit. Their procedures have since been changed to perform an inspection of all engines received in serviceable condition before being installed in the aircraft.

ONE BRAKE SHORT

The KC-135 was prepared for engine run: three chocks in place on each main gear, with two on the nose, 14,000 lbs of fuel.

The parking brakes were set by the operator in the left seat depressing the brake pedals while an inspector pulled the brake lever from the right seat.

Nr 1 and 2 engines were started and the generators checked. Then Nr 2 throttle was advanced to provide bleed air for starting three and four. During Nr 2 runup, the left main jumped the chocks. The aircraft pivoted right on the right main, the nose skidded 19 feet and hit a load bank, and the Nr 2 engine crashed into the ground start unit.

There were no skid marks on the chock or ramp. When the investigating officer entered the cockpit he found the parking brake lever set. The right brake pedal was depressed but the left was not. Unit engine ground run procedures now call for visual check of brake discs to assure parking brake is set.

Tech Topics



$ $ $ $ $

It cost the Air Force just about $30,000 when this J-57 engine was dropped on the hangar floor. Like so many accidents, this one resulted from failure to follow approved procedures (wrong tool used to lift aft end) and less than sterling supervision.

FOUR FAILED

During preflight the crew chief found the aircraft battery charge low so he requested a new battery. While awaiting a replacement he removed the APU battery and installed it in the main aircraft position. Later as the aircraft was holding at the runway for takeoff, the crew heard an explosion. The boom operator reported that the aircraft battery had exploded. All battery circuit breakers were pulled; damage was confined to the battery and case.

Investigation revealed that the battery the crew chief moved from the APU to main aircraft position had not been modified (vented) in accordance with TO 135 (K)A-2-10. Nr 18 cell had shorted causing the gas buildup and rupture of the battery. This unit inspected all batteries installed and in supply channels. Two additional unmodified batteries were discovered in supply and were removed and modified according to the TO.

How does an unmodified battery get in an aircraft without being detected? That's a good question. This one got by at least four people—the battery shop technician, the individual who initially installed it in the APU position, the inspector who signed the forms, and the crew chief who repositioned it.

A LITTLE FOD GOES A LONG WAY

During ACM the F-4 pilot discovered lateral control frozen. The right aileron was down about four inches in flight. The aircraft completed two full rolls before full right rudder brought it back to level flight.

A controllability check revealed that with full right rudder, full right stick pressure, half flaps, and the right engine at idle the aircraft could be controlled down to a minimum of 190 knots. The aircraft was successfully landed with the pilot holding the stick pressure full right with both hands, full right rudder and the WSO operating the throttle on the pilot's directions.

A ground intercom dust cover was found in the lateral control bell crank assembly. The dust cover in the incident aircraft was in place on the comm connector and attached by chain. The origin of the cover lodged in the bell crank is unknown.

Any time an item is missing, regardless of how insignificant it may seem, a thorough search should be conducted to determine its whereabouts. If not found it could turn up in some critical area, as this one did.

SIMPLE TASK

All was normal to level off at 15,000 feet when the T-33 pilot pushed the nose over to descend. The crew heard a pop and noticed what they believed to be engine vibration. An immediate return to base was accomplished.

During postflight inspection the left upper engine access door was found to have 15 dzus fasteners loose. The preflight work cards require that this door be opened during inspection for check inside the compartment. Apparently the

door was not secured following the inspection.

In another case a student pilot was unable to lower the nose gear of a T-37. The runway was foamed and the aircraft landed with minimum damage. The nose gear strut was not properly serviced during prior maintenance and hung on the nose gear door hinge.

In both cases, a seemingly simple task was not properly accomplished; strict compliance with tech data would have prevented both. Lots of people spent lots of manhours developing those tech orders. Use them and prevent errors in those seemingly simple tasks.

LOOK OUT BELOW!

The F-105 pilot had completed his proficiency check requirements and was headed home when he detected airframe vibration and saw the left external tank oscillating. Then there was a thump and the tank departed. The aircraft was recovered at home base without incident. The tank was located with the unexpended ejection cartridges in place.

Studies of the recovered tank revealed an outboard pylon cap installed on the inboard pylon and the yaw stabilization pins in the fully retracted position. This incomplete and improper procedure was accomplished during tank installation at the depot. The incident occurred on the first flight after return from the depot.

It took one of our editors about 10 minutes to locate the correct procedure for tank installation in the TO. Maybe this maintenance team saved 10 minutes by not following tech data, but the job was not done correctly.

Think of what could have happened had this tank separated just after the aircraft broke ground. Twenty-seven hundred plus pounds suddenly released from one wing at this critical phase of flight could have been disastrous.

C-130 FLAP DAMAGE

Approach and landing were normal but when the C-130's flaps were retracted during roll out the left flap remained fully extended. No further attempts were made to move the flaps.

Maintenance found that the master link on the left inboard jackscrew chain coupling had come apart, which caused the outboard link to break. The inboard jackscrew chain and one cotter pin were found in the flap well. The cotter pin had not been spread when installed. Vibration caused the cotter pin to fall out, allowing separation of the master link.

Who would think that our highly trained maintenance personnel could make such a mistake as this? Apparently the supervisor who signed off the work didn't or he would have checked the job a little more closely.

TEN-INCH CRESCENT WRENCH

During preflight walk-around of the F-4, the pilot noted that part of the left leading edge center wing flap was riding over, rather than under, the flap fairing.

The bird was turned over to maintenance and they found a ten-inch crescent wrench behind the flap. When the flaps were raised on a prior flight the wrench was forced against the BLC duct; this in turn forced the duct against the fairing causing a bulge and misalignment of the fairing.

Review of the aircraft records indicated no recent maintenance had been performed in this area. The owner of this ten-inch tool could not be located. Can you account for each and every one of your tools on a moment's notice? A professional mechanic could.

T-BIRD WIRING

On landing roll as the T-33 pilot applied brakes, the right brake felt mushy. Several attempts were made from both cockpits to pump up pressure without result. The aircraft slowed, lost aerodynamic steering and rolled to a stop in the grass without damage.

The cause: The boost pump shielded ground wire separated from its terminal end in the right speed brake well. This wire came in contact with the right brake hydraulic tubing. Arcing burned a pin hole through the tubing.

This unit has added a plastic insulator over the grounding wire and a clamp to secure the wire and prevent chafing. How's this area on your T-Birds? Have you inspected the boost pump wiring lately? Now might be a good time to give it a look-see.

Hello there, I'm Connie Wilhite. You're right, I'm new on the TOOTS page this month. The girl you are used to seeing on this page got married and left town, so I shall try to take over and help you with your maintenance problems. You remember that my name, TOOTS, stands for **T**ech **O**rder coming and going with an **S** on the end for Safety. I'll try to dig up the answers to your questions and also offer helpful hints from time to time. Of course, I need to know what is bothering you, so keep my mailbox filled. Write to: TOOTS, Aerospace Safety Magazine, AFISC/SEDA, Norton AFB, CA 92409.



Toots

Dear TOOTS

Here's a problem I'll bet you've never run across. According to AFM 127-101, paragraph 10-21(d), electronics workers are not supposed to wear metal jewelry, including metal rim glasses when working on energized electrical equipment.

What I would like to know is, does this part about metal rim glasses apply when performing an ops check on a system on the aircraft (no open units or exposed power)? If it does, why is a navigator allowed to wear metal rim flying glasses when he is operating the same equipment and doing the same things to it?

Sgt Michael E. Lauman
21st AVMS-INS
APO Seattle 98742

Dear Mike

You're right, I've never run across this question before. The answer is—no, this paragraph does not apply during operational check. To clarify, operational check means throwing the switches and operating the system as on an operationally ready aircraft. The moment a discrepancy is discovered and you proceed to open (gain access) to the system, the contents of paragraph 10-21(d) apply.

You can look forward to a change to AFM 127-101 which will delete paragraph 10-21(d). This subject will be covered in paragraph 10-6(a) of the revision.

Toots

Dear TOOTS

Discussion over the intent of TO 00-20-1, Section III, Para 3-10, clearly defines the procedures on how to clear Dangerous Conditions indicated by a Red X or Circled Red X. But another subject has come about that also is an aid in putting quality maintenance into the product and that is the In Process Inspection which is covered in TO 00-20-1, Section IV, Para 4-14.

My question is, TOOTS, if you are on orders to clear Red X and Circled Red X conditions, do you also have to be In Process qualified? Currently, we are at odds here over this in that some of the people believe that an In Process Inspection has to be complied with by the same person who signs off the Red X. Others believe that if an In Process Inspection has been overlooked, a final shakedown by a qualified inspector or supervisor will sign off the Red X.

Since you have helped so many before, we are seeking your advice on this matter for all concerned.

SMSgt Redmond B. Sullivan
APO New York 09223

Dear Red

Nice to hear from you and to know that you over there are concerned about putting quality maintenance in the product.

No, you don't have to be In Process qualified to clear the Red X or Circled Red X. Individuals authorized to perform either inspection (In Process Inspection or Red X "Safety of Flight") should be appointed by the maintenance officer based on their qualifications and authorized on orders. Based on their qualifications, some individuals could appear on either or both lists.

Keep up the good work. I have never seen an OMS supervisor who didn't have a full-time job.

Toots

Dear TOOTS

I maintain the TO file for my section. In the course of my work I have encountered a great deal of what seems to be unnecessary duplication. As an example, the following TOs provide technical information for the equipment indicated:

33A1-8-349-11	RM561A
33A1-13-294-12	RM561A
33A1-13-324-1	561A
33A1-13-387-1	RM561A
33A1-13-399-1	RM561B

I have two questions concerning this group of publications:

1. Are all of them needed to support the 561 series oscilloscopes?

2. If so, why aren't they at least grouped into a single series?

TSgt Peter D. Foster
Forbes, AFB, Kansas

Dear Pete

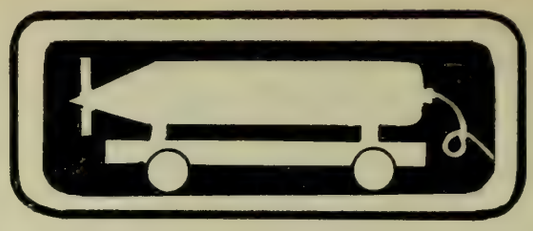
Yes, all these tech orders are required for those of you who must deal with the 561 equipment. I agree, some of the info is duplicated, but all of these tech orders are necessary, depending on the model and configuration of the equipment.

They are grouped into a single series (the 33A1 series). I think you meant to ask why they aren't grouped into one single tech order. Due to the volume and content of these tech orders, I don't believe it would be feasible to combine them into a single TO. However, if you feel strongly about combining any or all of them, the AFTO Form 22 would be the route for you to follow.

Toots



NUCLEAR SAFETY AID STATION



USI

Recently, the Director of Nuclear Safety received a report involving an F-4 aircraft monitor and control malfunction indication during postload checks. Appropriately, the weapon was downloaded prior to the accomplishment of additional aircraft armament circuitry checks (AN/GWM-4 and MX-6050). These checks did not detect a fault, so another nuclear weapon was loaded and the malfunction did not reappear. The sequence of *download* then *troubleshoot* (including weapon checks, if appropriate) is exactly what a forthcoming change to all bomber/fighter nuclear weapon loading -16 technical orders will require. However, in this case the cause of the original malfunction was not determined and further checks of the aircraft were warranted prior to loading the second weapon. For the F-4, an AN/AWM-13A test and/or a trial loading

REMEMBER LAST YEAR?



Last year there were several Reentry Vehicle Guidance and Control (RV G&C) van mishaps where road and weather conditions were contributing factors. Here are some examples from which we can learn how to prevent repetitions:

- A convoy encountered dense clouds of wind-blown lime which a farmer was spreading in the adjacent field. The driver of the RV G&C van slowed to about seven mph because of the reduced visibility. A civilian vehicle traveling in the opposite direction crossed the centerline and struck the van. The civilian stated he was blinded by the lime, could not see the road, and saw the RV G&C van only when it was too late to avoid a collision.

- A maintenance support van was traveling in a convoy. While braking on an ice-covered portion of the highway, the maintenance van slid off the road onto the shoulder. The shoulder then collapsed and the vehicle tilted on its side, thus becoming disabled.

- A single engine plane was observed crop dusting fields adjacent to a missile site. It became apparent to the convoy commander that the plane would be making low level passes directly over the site and loaded payload transporter. The convoy commander removed one of the "explosives" signs from the payload transport and held it up so the pilot might see it. The pilot either failed to see the sign or ignored it. He proceeded to make several passes about five feet directly over the payload transporter. Fortunately for the convoy personnel, the pilot did not spray as he passed over the site; however, the wind did carry some of the crop dusting agents onto the site. The result of this incident was that base operations personnel took action to coordinate with local federal aviation authorities and missile maintenance controllers to preclude further occurrences.

In all three cases we see indications that the exercise of good judgment by the vehicle operators, both civilian and military and the civilian airplane pilot, was questionable. Road, weather, and man-caused conditions were contributing factors.

In two of the three cases the resulting damage to USAF equipment was minor, but the potential for serious consequences was present in all three cases.

UCLEAR WEAPONS AS TESTERS

with an appropriate Type 3A trainer could have been performed. This is an improvement over last year's record when we had several cases of trouble shooting using nuclear weapon-loaded aircraft. As a result of last year's record, a *TIG Brief* article and two *Aerospace Safety* magazine AID Station summaries were published. In addition, the -16 loading technical orders for all bomber/fighter aircraft are being changed, as mentioned above, to include a warning on the subject.

We must continue to improve until an acceptable level of safety has been reached. So, if there is any doubt, check it out completely.

WHO LET THEM IN?



Since January 1972 there have been three separate violations of security standards for the logistic movement of nuclear weapons which involved unauthorized entry into no-lone zones. In one case, the aircrew was in the no-lone zone but was not notified that maintenance personnel had entered the area. In the other two cases, maintenance personnel were granted access to logistic aircraft without the courier officer or aircrew members being present for escort.

AFM 207-10 specifies that the weapon courier establishes procedures for authorizing access to the no-lone zone. All major commands currently transporting nuclear weapons instruct the courier to brief the senior security police representative present on authorization procedures. These major commands require that service and support personnel will be cleared for access by only the courier or his designated representative.

In all other cases, strict attention to instructions should have eliminated the violations. Whether the courier gave an inadequate briefing or the security personnel did not understand the instructions, the important point is that the violations occurred. The cooperation of all concerned is necessary to make sure they don't happen again.

IN A HURRY



During a recent aircraft generation exercise, two life support section personnel were permitted unescorted access to a weapon-loaded aircraft. Apparently, the personnel involved were so intent on meeting aircraft generation times that they either forgot or ignored Two-Man Concept requirements. AFM 35-99 requires that personnel not under the Human Reliability Program must *always* be under the escort of two individuals qualified to implement the Two-Man Concept upon their entry into a no-lone zone. Being rushed for time is never justification to violate the Two-Man Concept.

HUMAN  RELIABILITY

Several recent reports of Two-Man Concept violations have their origins in failure to properly administer the Human Reliability Program (HRP). Basic to safe peacetime operations involving nuclear weapons is the assumption that evidence of unreliability will be identified and reported. Appropriate measures must be taken to assure the personnel whose reliability is in question are not qualified under the HRP. After-the-fact investigations of recent incidents have proven that the persons involved had shown signs of unreliability before the occurrence. If the symptoms had been detected through continuous HRP monitoring, perhaps the nuclear safety deficiencies could have been prevented and the potential for more serious problems would have been eliminated. You all know that nuclear safety is your job and cannot be left to the commander. If your buddy plays Russian roulette, don't assume that a suicidal friend is more competent than a suicidal stranger. If a guard reports for duty while intoxicated, don't post him to a duty "protecting" nuclear weapons.

Reporting observed unreliable behavior is less distasteful than being found an accessory to a nuclear accident/incident. Unprofessional behavior on the part of a "buddy" is no excuse for similar behavior on your part. HRP is vital to nuclear safety and YOU are vital to the HRP. ★



MAIL CALL

TRANSIENT SERVICES

For a period of six months last year I was assigned as maintenance officer to the Mission Support Branch, which included Transient Maintenance. Month after month, I would read Rex Riley's Cross Country Notes and continually see complaints from pilots concerning different transient services.

I have flown on many cross countries and I can realize why many air crews are unhappy with Transient Alert. After flying a number of hours and especially if you have to make some further destination, you expect immediate service from TA. However, there are many local problems that transient aircrews are not aware of when they land.

Recently the Army Chief of Staff landed at this base. During a one hour period six other general officers landed to be present when the Chief of Staff arrived. That is a total of seven code aircraft in addition to Air Evac which was on the ground.

Immediately prior to the arrival of these aircraft a helicopter landed. It was explained to one crewmember that there would be a delay for fuel until the requirements of the priority aircraft were met. I happened to be in transient to observe the code arrivals, when the entire crew of the chopper came in. At this time I explained that the fuel trucks were standing by for the codes. The aircrew commander said it would only take ten minutes to refuel his aircraft and he could be gone. I again told him the trucks were required to stand by for the codes.

The pilot said he didn't have time to wait and he wanted a power unit. I told him we would get one as soon as we had a tug or truck available. It was approximately five minutes before a tug became available. During this time the chopper started on internal power and departed with an angry flight crew.

If some aircrews would just realize that transient personnel are trying to do a good job and are not trying to give them the runaround, things would flow a lot smoother and people would be a lot happier.

1Lt Donald A. Philpitt
Davis-Monthan AFB, Arizona

You're right. After a good reason has been offered and the pilot is still unreasonable, there's not much you can do. I believe most of our troops are satisfied if you explain your problem.

"$20.65 WHY BOTHER"

I find your article, "$20.65 Why Bother" (April 1972), most interesting. The last paragraph attempts to pound home the point that many major accidents result from trivial incidents and, how true this is. However, before taking the reader to task you should, maybe, insure your own backyard is clean.

To wit—in the second paragraph it states that the T-33 abruptly rolled left to nearly 90 degrees. In the fifth paragraph the article states, "However, when air loads were applied on takeoff the right flap retracted." Most aircraft I have been in would have rolled right. Strange airplane you fly—GI!

Everyone makes mistakes—some just get caught at it during critical moments of flight or during moments of stress—and, some while sitting relaxed at the desk. The wording of your last paragraph really is ironic and deserves rereading—WORD FOR WORD.

Lt Col Darwin L. Robison
Hill AFB, Utah

The split-type flap on the T-Bird has a higher coefficient of drag than a normal flap. As airspeed increases, drag increases at a greater rate than lift. Roll direction with differential flaps depends on the relative magnitudes of rolling moments due to yaw and asymmetrical lift. ★

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UNITED STATES AIR FORCE

WELL DONE AWARD

Presented for outstanding airmanship and professional performance during a hazardous situation and for a significant contribution to the United States Air Force Accident Prevention Program.





Captain RALPH J. LUCZAK

Captain EUGENE L. LARCOM

21st Tactical Air Support Squadron, APO San Francisco 96321

On the morning of 2 November 1971, Captains Luczak and Larcom were scheduled to fly an area orientation mission in an O-2. After two hours of uneventful flight, the crew heard a loud "bang" and the nose of the aircraft dropped sharply to a 35 degree nose low attitude.

Captain Luczak immediately retarded the throttles to idle and pulled back on the control yoke in an attempt to return the aircraft to level flight, but there was no response to control inputs. Captain Larcom attempted at regaining control while Captain Luczak positioned the cabin door in preparation for the seemingly inevitable bailout. However, the nose began to lower due in part to the airspeed which the aircraft had gained in the dive and to Captain Larcom's discovery that the pitch attitude was responsive to inputs on the manual trim wheel. Both crewmembers confirmed the positive effectiveness of the manual trim, and determined that control was sufficient to attempt a landing, although one man could not safely manipulate both aileron and power controls. Therefore, Captain Larcom assumed control of the ailerons, rudders, and elevator trim, while Captain Luczak handled the throttles and assisted Captain Larcom on the aileron and rudder controls.

As Captain Luczak advanced the throttles, the rear cockpit vibrated severely and the propeller pitch could not be controlled, which forced him to shut down and feather the engine. Having alerted control agencies to the emergency, the crew gently maneuvered to line up on an eight mile final approach. Six miles from the runway at 2700 feet, the crew extended one-third flaps. Having adjusted to this change in configuration, they then extended the landing gear. Their shallow glide path was smooth until approximately 50 feet above the runway. At this time, combined ground effect and power reduction caused the pitch attitude to increase more quickly than the manual trim could counter. The aircraft dropped quickly to the runway, contacting on all three wheels simultaneously. The hard touchdown blew the nose gear tire and bounced the aircraft 25 to 30 feet into the air. The crew regained control of the aircraft and accomplished a smooth touchdown.

Investigation revealed that a counterweight had come off and gouged one blade of the rear prop. This accounted for the severe engine vibration. The counterweight then penetrated the left boom and completely severed the elevator and left rudder cables. Through professional response, superior airmanship and coordination, Captains Luczak and Larcom undoubtedly prevented the loss of a valuable USAF combat aircraft. WELL DONE! ★

SAFETY AWARDS 197



FLIGHT

17th Tactical Airlift Squadron	AAC
1867th Facility Checking Squadron	AFCS
3500th Pilot Training Wing	ATC
3650th Pilot Training Wing	ATC
3615th Pilot Training Wing	ATC
1st Helicopter Squadron	HQ COMD USAF
89th Military Airlift Wing	MAC
40th Aerospace Rescue and Recovery Wing	MAC
9th Weather Reconnaissance Wing	MAC
3d Aerospace Rescue and Recovery Group	MAC
366th Tactical Fighter Wing	PACAF
23d Tactical Air Support Squadron	PACAF
8th Special Operations Squadron	PACAF
410th Bombardment Wing	SAC
376th Strategic Wing	SAC
23d Tactical Fighter Wing	TAC
316th Tactical Airlift Wing	TAC
26th Tactical Reconnaissance Wing	USAFE
302d Tactical Airlift Wing	AFRES
177th Tactical Fighter Group	ANG



MISSILE

21st Composite Wing	AAC
87th Fighter Interceptor Squadron	ADC
22d Air Defense Missile Squadron	ADC
10th Aerospace Defense Squadron	ADC
Space and Missile Test Center	AFSC
18th Tactical Fighter Wing	PACAF
366th Tactical Fighter Wing	PACAF
68th Bombardment Wing	SAC
341st Strategic Missile Wing	SAC
381st Strategic Missile Wing	SAC
1st Strategic Aerospace Division	SAC
57th Fighter Weapons Wing	TAC
36th Tactical Fighter Wing	USAFE
119th Fighter Group	ANG



EXPLOSIVES

21st Composite Wing	AAC
Air Defense Weapons Center	ADC
56th Special Operations Wing	PACAF
57th Fighter Weapons Wing	TAC
48th Tactical Fighter Wing	USAFE

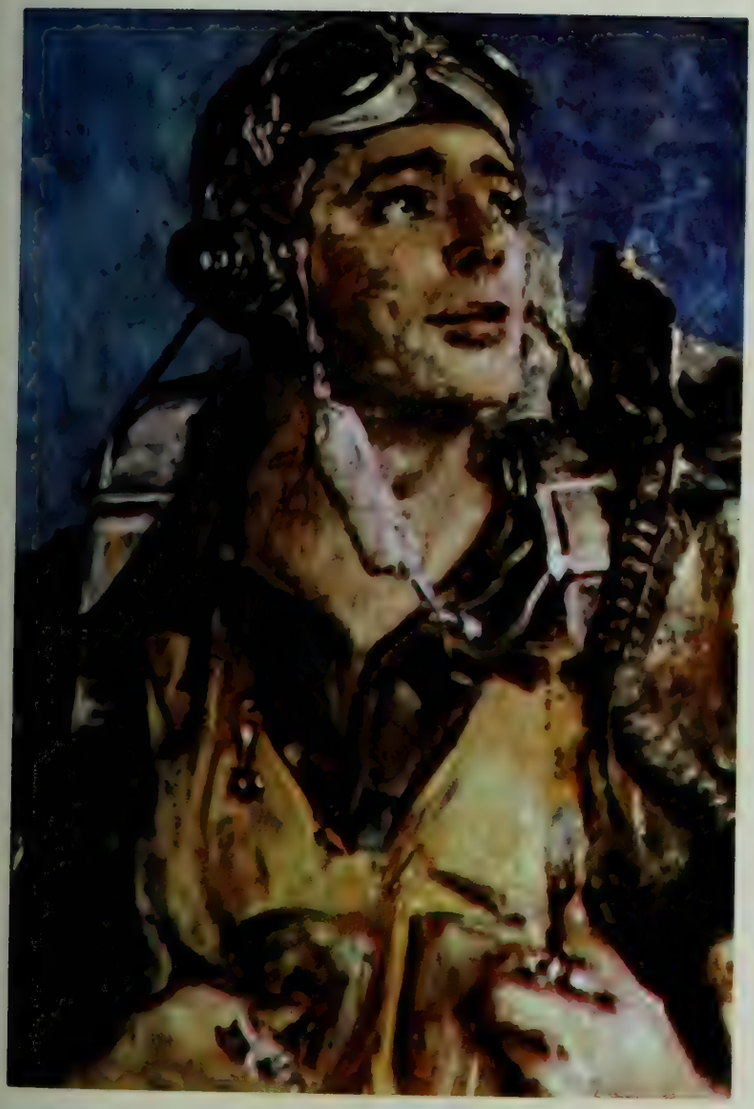


NUCLEAR

460th Fighter Interceptor Squadron	ADC
87th Fighter Interceptor Squadron	ADC
3097th Aviation Depot Squadron	AFLC
14th Military Airlift Squadron	MAC
91st Strategic Missile Wing	SAC
341st Strategic Missile Wing	SAC
319th Bombardment Wing	SAC
410th Bombardment Wing	SAC
20th Tactical Fighter Wing	USAFE
322d Tactical Airlift Wing	USAFE

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Aerospace SAFETY



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UNITED STATES AIR FORCE **AUGUST 1972**

Aerospace SAFETY

FOR AIRCREWS, MAINTENANCE & SUPPORT TECHNICIANS

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USAF AT 25

Twenty-five years isn't very long in the annals of time, but in that span the Air Force has made some remarkable progress. What immediately comes to mind are the radically different aircraft of today, as compared to those extant in 1947 when the Air Force was born.

There were no swept-wing, Mach 2 fighters, no supersonic bombers, no jet transports that today shrink the Pacific crossing to less than half a day. There were some early jets and World War II aircraft such as the Mustang and Jug, the T-6, B-17, B-29 and the "Gooney Bird." The "Goon" is still with us and who wants to bet a few of them won't still be around when the Air Force reaches 50?

There was a flying safety magazine in 1947 and there surely must have been a wealth of material to fill its pages, considering that there were 1,555 major accidents that year for a rate of 44.0 per 100,000 flying hours. For the next several years the accidents increased but we were flying more, so the rate declined. The safety program really began paying off in 1957 and from that point the number of accidents has continued to decline. Contrast the major accident rate of 2.5 in 1971 to the 44.0 in 1947.

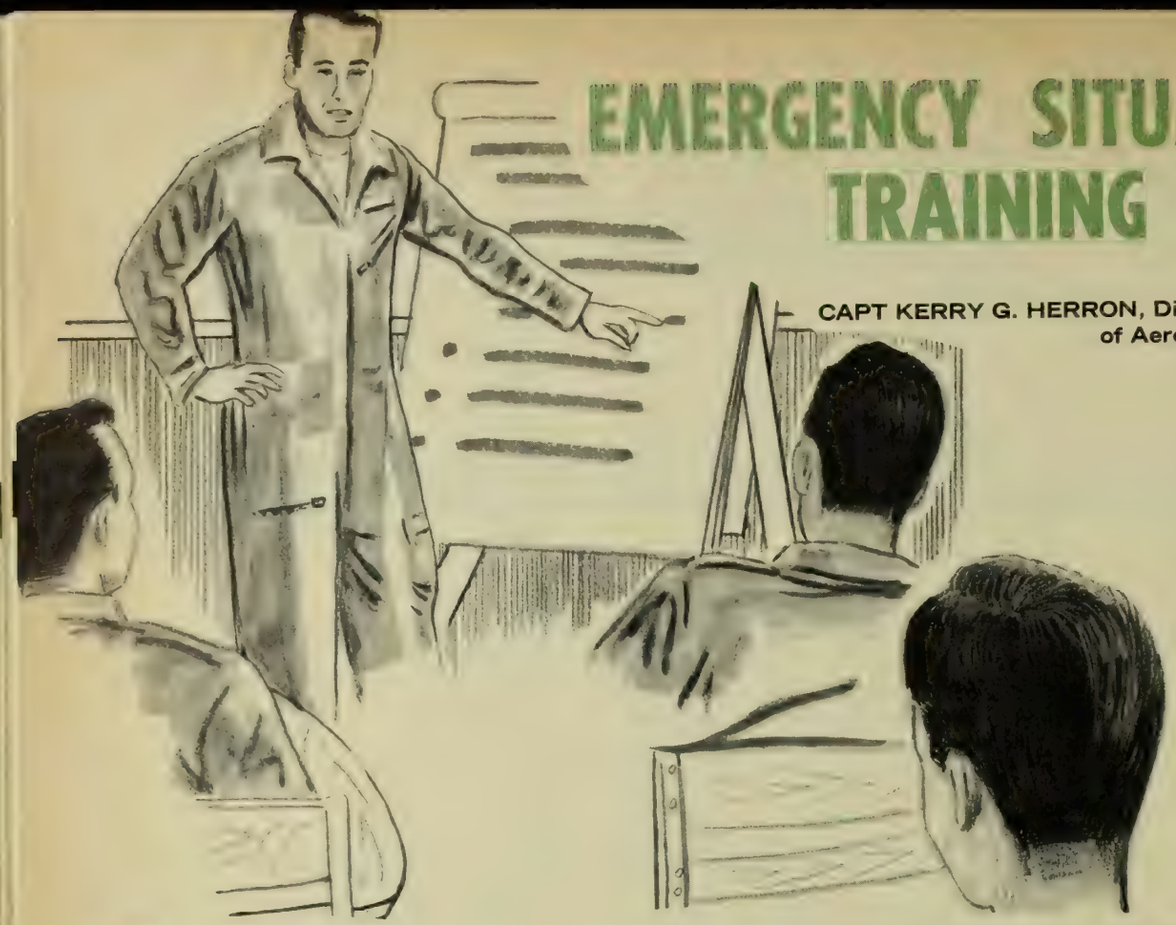
Records, however, are significant only in what they stand for. Our successes in accident prevention stand for lives saved and aircraft available to perform the Air Force mission. In 25 years we have lost a lot of fine men and aircraft in needless accidents. But we have continued to do better; we have learned and have applied the lessons of the past to the problems of the future.

We are now living in the future that we only contemplated in 1947 and we can feel a great satisfaction in our accomplishments. But satisfaction, unfortunately, often leads to complacency. We cannot afford to be complacent while we still have 150-200 major accidents per year. We must continue to use every asset we have to continue reducing the number of accidents. To this end improved design concepts and manufacturing methods are now a requirement. With more safety built into the product, we, as operators, must enhance that built-in safety with continuing improvements in training, workable operational concepts and knowledgeable management.

We have proved we can do these things and we look forward to another 25 years of even greater success.

EMERGENCY SITUATION TRAINING

CAPT KERRY G. HERRON, Directorate of Aerospace Safety



Aircrew practice and testing of immediate action emergency procedures is a well established part of every unit's training program. This type of rote memory training and response is important and necessary, and should continue to receive heavy emphasis, but not to the exclusion of general emergency procedure training involving situation analysis. Too often aircrews practice the bold face items thoroughly, but then do little thinking, reading, talking, or practice of emergencies not requiring immediate action.

No checklist is thorough enough to provide for every contingency or situation, and neither is any other guide yet devised. Aircrew judgment, supplemented by supervisory guidance when available, must provide the course of action in situations not specifically covered by published emergency procedures.

Judgment development is a lengthy process, dependent to a great degree on flying experience. Few training devices are available that concentrate primarily on judgment development, but there is one that offers real applicability, has been used successfully in several units, and is the subject of this article.

Theoretical, yet practical, emergency situations can be formulated, and when presented for analysis and discussion, can provide exercises in judgment development. These exercises can be based on occurrences described in Air Force or major command safety publications, personal experience or that of acquaintances, or may be entirely hypothetical. The exercise must include all the information necessary to mentally place the pilot in the situation, such as weather, mission, cockpit indications, and any other factors necessary to allow the participants to thoroughly analyze their predicament and choose what they consider to be the appropriate actions.

If carefully constructed, situation exercises can promote an exchange of ideas and experiences between old heads and new troops.

The situation, emergency and analysis should be presented on viewgraphs or slides, and projected on a screen for aircrew study. The answers and key factors for discussion should be presented on a separate card for use of the discussion leader, who should have either prepared the exercise or reviewed both the situation and the suggested answers. These discussions often last long after the meeting, and can even send an old head or two scurrying for his Dash-one. The exercise has been tested, is *known* to be effective, and can be used for all types of aircraft and missions. A few suggestions and examples follow:

- Select a project officer from among the safety or training officers who *wants* to try the exercise. Have one or more supervisors review his proposed situations to insure accuracy and complete contingency considerations. Don't force someone to run the exercise who doesn't have a real interest and who won't devote the time necessary to develop well thought out situations.

• After the project officer has established how best to implement the exercise locally, and has exposed the unit to several examples, others may want to contribute their experience or devise their own situations and present them for discussion.

• Don't convert this training tool into a testing device. Voluntary participation, contributions, and interest are essential to the exchange of ideas and the effectiveness of the training.

• Use the exercise at large aircrew meetings such as safety meetings, mission briefings for exercises, pilot's meetings, etc., but don't attempt to use it for every crew briefing or small group briefing on a daily basis. It seems to promote the best participation when used weekly or monthly, and when the practice situations are thoroughly researched. Daily use would not allow adequate preparation.

• Don't read aloud a detailed situation involving multiple variables and expect the participants to remember and analyze without an accompanying slide, viewgraph, or handout. The discussion leader should be prepared to discuss contingencies, to lead the discussion with everyone who wants to contribute, and to prevent monopoly by any one person.

• Formulate some situations where there is no specific, correct answer, in order that various aircrew opinions can be aired and discussed, often helping young pilots to reach the correct decisions on their own. (See Example 2, F-101 B/F.)

• Commander interest and participation will set an example and enhance acceptance of the exercise, and will often promote a higher degree of participation.

• The value of the exercise is in the analysis of the situation, the selection of applicable procedures, and the discussion and exchange of information and rationale between aircrew members. The end result is the direction of thought toward emergency contingencies which have no rote response requirement, before the actual emergencies occur. In short, an exercise in judgment development in an area terribly expensive to acquire by experience.

The following examples are presented to illustrate how to set up the situation.



AIRCRAFT T-33A

SITUATION: You are flying a T-33 target at FL 350 in a NORAD exercise, and your route has taken you over the Atlantic Ocean 200 NM from land. You are above an undercast; the weather between you and your recovery base is 800 ft overcast, visibility three miles. The tops are FL 310. The time is 0200 local.

EMERGENCY: The gyro instrument warning light illuminates; immediately you notice the OFF flag visible on the attitude indicator, and your heading indicator appears to be frozen.

ANALYSIS:

1. What has probably occurred?
2. What action(s) should you take?
3. With standby inverter operating, what instruments and/or navigation aids are inoperative?
4. If the standby inverter then fails, would you attempt to complete a penetration and approach under the existing weather conditions, and if you did, what flight instruments and navigation aids would be available?

ANSWERS: (Provided on a separate card for the discussion leader only.)

1. Main inverter failure.
2. Select standby inverter.
3. TACAN and IFF/SIF.
4. OPEN FOR DISCUSSION: The decision of whether or not to attempt the penetration should be a personal one, based on individual pilot experience, ability, and system knowledge. The best choices would be a VFR alternate, or a lead aircraft, but if no alternate or lead is available, and the penetration to the IFR base is to be attempted, radar vectors could be used, or VOR using ID-249 only, with the terminal approach being a no gyro GCA or a localizer only ILS. Flight instruments available would be magnetic compass, turn and slip indicator, vertical velocity indicator, airspeed indicator, and altimeter.



AIRCRAFT F-101B/F

SITUATION: You have begun the takeoff roll on a one hop flight from Duluth, Minnesota, to Tyndall AFB, Florida. The aircraft has no armament, and is double tanked with a full fuel load. The Duluth weather is 400 ft overcast, visibility two miles. The time is 0800L.

EMERGENCY: The takeoff progresses normally until afterburner termination, when a larger than normal reduction in power is felt. An immediate check confirms that both throttles are still full forward. A

EMERGENCY CONTINUED

glance at the engine instruments shows right engine RPM, EGT, and fuel flow falling. Your airspeed is 240K and bleeding off, and you have just entered the weather.

ANALYSIS:

1. What has happened?
2. Give the appropriate immediate action procedures.
3. Discuss aircraft attitude considerations.
4. If airstart attempts were unsuccessful, and the nearest suitable recovery base with weather better than Duluth AFB was Grand Forks AFB, with 2000 ft broken and seven miles visibility, would you proceed via single engine to Grand Forks, or would you attempt to land at Duluth?
5. If no further complications developed, and the weather remained the same, at what fuel state would you land?

ANSWERS: (Provided on a separate card for the discussion leader only.)

1. Right engine flameout.
2. THROTTLE—MAXIMUM (OPERATING ENGINE)
 EXTERNAL LOAD-JETTISON
3. Level off to maintain a controllable airspeed. With the aircraft under control, and airspeed permitting a slight climb, attempt airstart.
4. OPEN FOR DISCUSSION.
5. OPEN FOR DISCUSSION.



AIRCRAFT F-4C/D/E

SITUATION: You are number three in a flight of four for an early morning range mission. Your aircraft has one SUU 23, one SUU 20, and two external tanks. During the takeoff roll, shortly after rotation, the fuel low level and master caution warning lights illuminate momentarily (5 seconds), then go out. The takeoff is continued, and during climbout all fuel quantity indications are found to be normal. The mission progresses normally, with the brief use of afterburners required several times. After the external tanks and internal wing tanks have fed, simulated pop-up rocket deliveries are being practiced.

EMERGENCY: During afterburner pull-up for roll-in altitude, the fuel low level and master caution lights illuminate. You terminate afterburners and check the fuel at 5500/5500 (tape over counter), but the feed tank indicates 700 lbs and slowly increasing, and boost pump pressure is zero for both engines.

ANALYSIS:

1. Are you in danger of flameout?
2. What has probably caused the low feed tank situation?
3. If hydraulic and electrical systems indications are normal, why are all the pumps inoperative?
4. What type of recovery should be made?
5. Of what significance was the fuel low level warning light during the takeoff roll?
6. Should you have aborted the mission when the warning lights momentarily illuminated during takeoff roll?

ANSWERS: (Provided on a separate card for the discussion leader only.)

1. Only if afterburners or sustained negative Gs are used.
2. Hydraulic transfer pumps and electric boost pumps are not operating.
3. The hydraulic fuel transfer check switch has failed. If this switch is stuck in the test position, it will prevent operation of the electric fuel boost pumps and will prevent hydraulic fuel transfer pumps from operating when gear squat switch is open (weight off the gear).
4. Recommend straight in approach because all fuel transfer will be by gravity.
5. It was an early indication that fuel was transferring only by gravity until the weight was off the gear, allowing the external tanks to pressurize.
6. OPEN FOR DISCUSSION.



AIRCRAFT B-52D

SITUATION: You are the aircraft commander on a typical eight or nine hour training sortie that includes refueling, low-level navigation and bombing, and a celestial navigation leg. Aircraft gross weight is approximately 395,000 pounds

which includes a 210 fuel load. The takeoff weather is reported to be 700 feet overcast with tops at 8000 feet, visibility five miles, wind variable at 10 knots. Your initial climb clearance is to 12,000 feet with a climb to FL 310 when 35 NW of the departure fix. The time is 1400L.

EMERGENCY: During flap retraction, the gunner reports visible fire from Nr 7 engine. You look at the instrument panel and Nr 7 engine shows high EGT and the fire warning light is illuminated. The copilot also confirms fire from the Nr 4 pod.

ANALYSIS:

1. What has happened?
2. Give the appropriate "critical actions" for this situation.
3. If the steps in paragraph 2 above do not extinguish the fire, what would be your next course of action?
4. If the procedures in step 3 put out the fire, what would be your evaluation of the situation and what factors should be considered before landing?

ANSWERS: (To be provided on a separate card for the discussion leader only.)

1. Engine fire on Nr 7.
2. THROTTLE—CLOSED.
 FIRE SHUTOFF SWITCH—PULL.
3. Shut down Nr 8 engine using Emergency Engine Shutdown Checklist.
4. OPEN FOR DISCUSSION. The following are but a partial list of those factors that should be considered, and are provided to stimulate the discussion.
 a. Lateral control.
 b. Fuel management.
 c. Gross weight vs six-engine go-around.
 d. Stall speeds and approach speeds.
 e. Inoperative aircraft systems.



AIRCRAFT C-5A

SITUATION: You are the aircraft commander of a C-5A Pacific Cargo mission at FL 350. You departed Travis AFB at 0700 with a full fuel load. Takeoff gross weight was 712,500 lbs. Your destination is Wake Island, with an ETE of 10+30 hours, and a forecast of 500 feet overcast and one mile visibility. Your alternate, Andersen AFB, Guam, is three hours from Wake, and is clear.

EMERGENCY: Just after passing ETP, you experience extreme vibration of the Nr 1 engine which continues and intensifies, and the Nr 1 hydraulic system quantity gage indicates zero. One hour prior to landing, the Nr 2 engine oil pressure begins to fluctuate, and the engine oil pressure light illuminates. The corresponding oil pressure gage indicates 10 psi and is slowly decreasing.

ANALYSIS:

1. What steps would you accomplish in response to the Nr 1 engine vibration problem?
2. What systems will be affected by the loss of the Nr 1 hydraulic system?
3. What actions would you take in response to the Nr 2 engine oil pressure problem?
4. If two engines were shut down, and destination weather forecast was stable, what considerations would you give to reducing gross weight?
5. Discuss in detail your approach and landing roll procedures including configurations and systems availability.
6. If normal braking was lost, what braking system(s) would be available?

ANSWERS: (To be provided on a separate card for the discussion leader only.)

1. EMERGENCY ENGINE SHUTDOWN
 FIRE HANDLE—PULL (P)
 AGENT—DISCHARGED (P) if fire is indicated.
2. a. Flaps and slats will be available, but slower than normal to operate.
 b. Nose and aft main gear must be lowered by alternate gear lowering procedure.
 c. Crosswind gear capability not available.
 d. Normal nose wheel steering inoperative.
 e. Upper rudder powered by only one hydraulic system.
3. Discussion as to if, when, and how the precautionary engine shutdown should be performed.
4. Discuss cargo and/or fuel jettison procedures. If fuel is to be jettisoned, discuss how much, and destination weather versus alternate requirements.
5. Discussion Items:
 a. Three engine configuration and ILS approach procedures.
 b. Two engine configuration and ILS approach procedures.
 c. Go-around capabilities.
 d. Crosswind landing techniques without crosswind gear available.
 e. Nose wheel steering availability.
6. Emergency brakes (alternate braking system not available after Nr 1 hydraulic system failure). ★

DEADLY



This article is addressed to everybody whose job requires him to fly, work on or supervise maintenance on Air Force aircraft. We hope you read it and heed its message, because this subject is too important to ignore.

We call it FOD—but color it *deadly*, because that's what it is. Deadly to engines, aircraft and—to aircrews. The death of an aircrew because a tool was left in the controls is an unforgivable tragedy. Yet every year this FOD costs the Air Force several lives and millions of dollars.

Generally we think of FOD in connection with aircraft engines. Most often objects are left in intakes and sucked into the engine with drastic results. A frequent contributor is the ground crew carelessly handling safety pins which find their way into the intake. An engine change is the next step.

If all the tools chewed up by aircraft engines were assembled undamaged they would no doubt equip a squadron, with plenty of spares.

Whenever tools are left where they cause damage, there are two culprits. One is the man who left it there and the other is the supervisor or inspector who failed to find it.

A recent case in point: Prior to a maintenance engine run a foreign object inspection was accomplished. During the run a problem developed and an adjustment was required. Again it was inspected. Later in the day an engine screen was installed and the aircraft towed to another location for trouble-shooting. When the engine was started sparks flew from the exhaust. Pieces of a flashlight were found in the compressor section. Cost for overhaul exceeded $30,000.

In this case, someone was guilty of leaving the flashlight in the intake. Engine damage was guaranteed when the engine screen was not removed and the area inspected, although local procedures called for such an inspection prior to every engine run.

Lest we point the finger too sharply at the maintenance people, let us realize that FOD is sometimes caused by aircrews. Pilots leave checklists, gloves and other items in intakes with resultant engine damage. Seems the engine intake is an ideal place to put things during the walk-around.

FOD extends well beyond the engine and we must attack the problem on a broad front. Possibly the most dangerous place for a foreign object is in the flight controls. Since 1965 there have been at least 85 reported mishaps resulting from flight control FOD. This has cost four lives, several aircraft and many, many dollars, not to mention aircraft downtime. In 1971 there were eight incidents in the F-4 alone where foreign objects were found throughout the aircraft, from the cockpit to the bellows and venturi assembly of the artificial feel system. A pair of pliers in the control linkage cost us an airplane and a crew.

Reports of cases that have been investigated indicate that where debris is found depends on aircraft configuration. But, in general, statistics indicate items are found in the wings 37 percent of the time, in the cockpit 25 percent of the time, tail 21 percent and fuselage 17 percent.

What kind of stuff are we talking about? The following will give some idea, although the list is by no means complete.

9-inch steel punch
Open-end wrench
Nut plates
90° offset screwdriver
⅜" universal socket
Wire bundle tie
Spool of wire
Flashlight

FOD

17-inch sheet metal stiffener
Cloth
Nuts
Bolts
Clipboard
5½-inch chisel

Cockpit FOD, while not as prevalent as in the wings, frequently results in extremely serious consequences. Safety pins, filmpacks, flashlights, clipboards and the like have jammed controls, caused unintentional ejections—or prevented ejection—and caused throttles to bind. These have generally been crew-induced, which indicates a need for better foreign object discipline on the part of crewmembers. And it's their lives at stake.

The biggest problem, however, is with the maintenance people, primarily because that is where the opportunity is greatest. Unfortunately, there seems to be an upward trend in FOD. In fact, one command reported a 58 percent increase in 1971 over 1970.

So what to do?

First, an organized, documented FOD prevention program is necessary. Now this is like saying we need a modern highway system to move traffic and prevent accidents. We have programs already—from Air Force level on down to local units. But plans and paperwork, in and of themselves, do not prevent accidents. People prevent accidents by using their brains and by application of self-discipline.

For example, non-destructive inspection has proven to be an important tool in FOD prevention. The vari-ramp area of the F-4 is prone to collect foreign items during maintenance. Radiographic inspection (X-ray) has been invaluable in determining whether there is debris in that area. (See article page 24.)

Tool control is a most fruitful area for improvement. Self-discipline is an important factor here. The man working on the aircraft is *responsible* for the tools he uses. He is responsible to himself, the aircrew and his country to prevent the careless handling of tools from causing an accident. One problem is the inexperienced maintenance man who may not realize the seriousness of misplacing a tool.

We recently asked a major airline for information on their FOD problems and prevention. They replied that FOD due to misplaced tools is a minor problem. They attribute this to the experience level of their mechanics, the consequences to an individual who is identified as the one who left a tool that causes an accident, and the fact that the mechanic is responsible for his tools.

For many reasons, the Air Force situation is different. Nevertheless, the airline's success shows that a well-supervised program to prevent FOD due to tool misplacement can succeed.

Another area that requires attention is the ramp-taxiway-runway complex. While we do not see this as the major problem in FOD to the engine, airframe and controls, dirty surfaces are hard on tires, flaps and other areas—particularly the lower surfaces of the aircraft. We recall a unit that was having severe tire troubles. The problem was finally resolved by better cleaning of the hard surfaces. In another case, old concrete spalled and cracked and pieces were thrown by taxiing aircraft and ingested into engines.

Not mentioned so far is micro-FOD, those tiny particles that can play hob with delicate hydraulic and electrical systems. Work on these components requires absolute cleanliness—hence, clean rooms. Yet inspectors frequently find contaminated components, dust caps not installed and dirty floors and work benches. As aircraft systems become more dependent on these components and tolerances become smaller, micro-FOD looms as one of the most vexing problems with which we will have to contend. People working on these systems and QC inspectors would do well to redouble their efforts to establish and maintain the cleanliness necessary to the integrity of this equipment.

In the final analysis, FOD prevention begins at the top and permeates the entire organization. The commander and his supervisors are responsible for establishing viable FOD prevention programs. But a commander cannot prevent a 3-level airman from leaving a wrench in the flight controls. However, he can see to it that the young man has been trained in the use and care of tools and the serious consequences of a misplaced object in and around the aircraft. Supervisors must exercise their authority and responsibility in carrying out the intent of the program.

Finally, however, the immediate responsibility lies with us who have the last opportunity to remove an object that may cause an accident. We are the maintainers and the aircrews—the guys with that tool, or a checklist, or whatever, that turns a work of art into a smoking pile of wreckage. Think it over. ★

THE IFC APPROACH

By the USAF INSTRUMENT FLIGHT CENTER
Randolph AFB, Texas, 78148

TAS COMPUTATION

Here is a technique for estimating TAS that will be helpful to pilots flying aircraft without a machmeter. Flight Lieutenant Millar, Royal Air Force exchange officer, offers this technique to his T-38 Pilot Instructor Training students:

JOT DOWN THIS CHART:

ALTITUDE x 1000	PERCENT INCREASE ADDED TO IAS		
5	3^2	+ =	9%
10	4^2	=	16%
15	5^2	=	25%
20	6^2	=	36%
25	7^2	=	49%
30	8^2	=	64%
35	9^2	=	81%
40	10^2	=	100%

Determine an estimated TAS by adding the applicable percentage to IAS. For example, the IAS at FL 250 is 180 KTS. Add 49%, or 88 KTS, to 180 KTS to obtain 268 KTAS. At 15,000 feet and 200 KIAS, the approximate KTAS is 250 (25% of 200=50). Try the technique; you may find it suitable for your needs.

TEARDROP ENTRY

Q If I elect to fly a teardrop procedure turn maneuver, must I fly a heading 30° from the reciprocal of the inbound course?

A Not necessarily. A "course" should be thought of as a ground track and the aircraft's "heading" as a means of remaining on that track. It may be necessary then to adjust heading as required to maintain or intercept the teardrop course. AFM 51-37 states that a teardrop course will be 30° or less from the inbound course and on the depicted side. This will position the aircraft so that the inbound turn will place the aircraft on or near the inbound course. Where positive course guidance is available, attempt to intercept and fly the teardrop course using any navigational aid available in the cockpit. Without positive course guidance, i.e., TACAN fix or marker beacon, etc., the heading used to fly a teardrop course must be estimated by the pilot.

* * * * *

POINTS TO PONDER

Have you noticed that ILS back course approaches are now published in the Low Altitude Instrument Approach Procedure books? The FAA has begun installation of back course glide slope transmitters at some major civilian aerodromes to provide an increased operational capability (see ILS BC RWY 11R, Minneapolis-St Paul Intl). These are precision approaches; however, due to the increased localizer sensitivity when approaching the end of the runway where the localizer transmitter is located, the BC ILS minimums are higher than front course precision approaches. Civilian localizer transmitters are tailored so that the front and back courses are the same width, between 3° and 6°.

Consider the situation where a runway has published front and back course approaches. At DH on the front course, the aircraft is approximately 14,000 feet from the localizer transmitter and the localizer width is approximately 1200 feet. The back course approach (same localizer transmitter), if flown to the same DH, would place the aircraft less than one-half mile from the localizer transmitter, and the width would be approximately 260 feet. Therefore, it is obvious that the localizer would be far too sensitive to provide adequate course guidance if flown close enough to the runway for normal ILS minimums. Perhaps more important to the military pilot is the fact that this is a *back course* approach and should be flown with the published front course set in the course selector window to obtain a directional CDI in relation to the aircraft symbol/heading pointer. ★

THE CAPABILITY-JUDGMENT GAP

LT COL VICTOR J. FERRARI, JR., USAF, MC

The article reprinted here is one of the most popular published in *Aerospace Safety* in recent years, if one can judge by the number of requests for reprints and extra copies of the magazine in which it originally appeared. It is presented here exactly as it first appeared in the November 1968 issue.

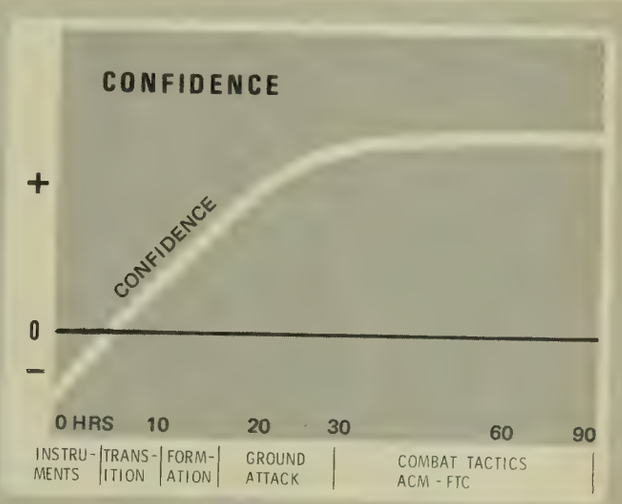
Those pursuits which require the development of manual skills generally indicate a need for the development of good judgment—or else great skill without good judgment might result in trouble for the individual. This is particularly true in flying and is a factor that must be taken into account in any training program for the development of piloting skill.

What we have just said, and what is about to be presented, is not new. In fact, we assume that nearly all pilots who read this recognize the concept as something learned in a practical way in youth and documented in some textbook at a later day. What *is* new is the chart upon which we have plotted curves representing certain factors indigenous to the kind of training program described. The chart presents graphically an abstraction that, while known, is not always recognized nor acted upon—a desert-like area of the chart we call the *capability-judgment gap.*

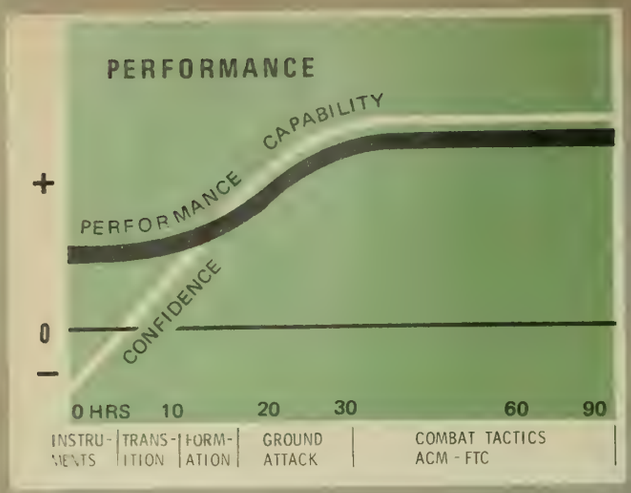
The chart came about as the result of a study of an F-105 Replacement Training Unit. The aim of the study was to identify all factors which have accident potential.

The method used was an analysis of the psychological and physiological stresses of the training program and student capability and limitations. Techniques included interviews with students who had recently graduated from undergraduate pilot training (UPT), squadron commanders, and IPs, medical evaluation of the training program (inflight and ground) and a review of accident experience. We should point out certain factors:

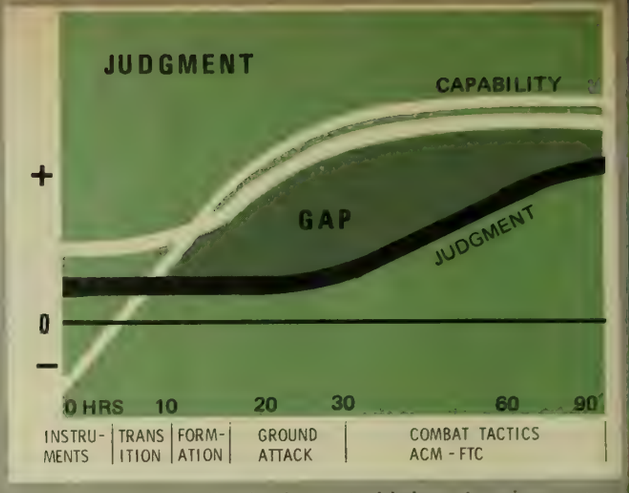
- The majority of students involved in accidents was evaluated as above average in the course.
- Some students were direct from undergraduate pilot training, while others were experienced pilots but



The graph at right depicts the buildup of student confidence throughout the training program. Student interviews indicate that they enter the F-105 program with a "healthy" apprehension as depicted by the portion of the curve below the base line. Confidence builds rapidly, with most students stating they "get ahead of the aircraft" by the second or third transition ride. Confidence continues to rise to the high confidence level of the typical fighter pilot. IP interviews verify this rise in confidence.



The black line depicts student stick and rudder performance. The student enters the program with moderate capability in this skill. Instructor pilots testify that this ability rapidly rises and closely parallels the confidence level. This is to be expected because confidence and performance reinforce each other. For the purpose of this discussion, we equate confidence and performance to capability.



This curve represents the development of judgment, or is comparable to the student's capability to correctly estimate the effect of all human and environmental factors on his "real life" capability. This starts to rise toward the middle of the ground attack phase, after he has had enough experience to convince himself he can and will make mistakes. As mentioned previously, this capability-judgment gap is validated by automobile and general aviation accident experience. This curve flattens out below the "capability" curve and may never merge with it.

new to tactical fighters (only one had any significant tactical fighter experience).

• The accident experience covered in this study was too limited to be applied with statistical significance to the concepts discussed here.

• The Capability-Judgment gap is validated by correlation of accident rates and age groups, in general aviation and automobile accident experience.

• The curves on the charts represent judgment factors and are not intended to imply mathematical values or relationships. Their shapes are based on student and IP interviews, review of training folders, and general aviation and automobile accident experience. The curves should be expected to vary in shape and magnitude with specific training programs and personnel. However, the concepts are valid for any flight training program.

As the charts show, there exists a gap between a student's capability and his judgment development. This gap occurs early in a training program and would be predictably greater in the more aggressive student.

One thing we were especially interested in was the role competition plays in this type of training program. The UPT students who are assigned to F-105s are selected for their competitive background, and well so, for the tactical fighter mission demands an aggressive, competitive personality. Student and IP interviews, both formal and informal, reveal that this competition is not very apparent during the orientation/transition phase of the program. However, as soon as the students "get their feet on the ground" it rises rapidly. Formation and ground attack naturally stimulate the competitive spirit of the students with a positive correlation with the students' aggressiveness.

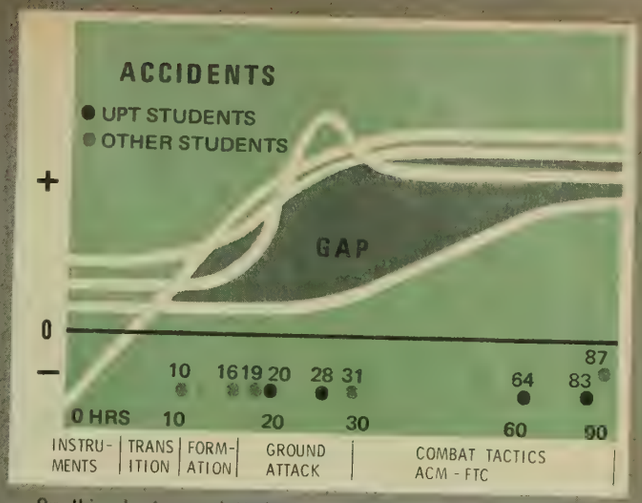
Rarely does this competitive spirit result in an accident. More often it results in a "near miss," which only the student knows about and never talks about. This experience has great learning value because it produces "judgment." Note the time correlation of the two curves, with the judgment curve starting to rise just after this peak.

Even if an accident rarely results, the accident potential during this phase is great. It must be recognized and controlled in order to optimize the learning process without compromising safety!

So where does all this lead? It leads to the conclusion that the instructor pilot must fill the capability-judgment gap. This means that instructors must exercise mature judgment in their supervision of students. Inexperienced or immature instructors may misinterpret the observable self-confidence and performance of students as an indication of good judgment and, consequently, set up a potential accident. Therefore, instructor pilot upgrade programs must emphasize a sound student-IP relationship with special attention to the capability-judgment gap. Finally, supervisors must closely monitor inexperienced IPs in order to develop



The element of competition is shown here. The graph depicts the competition curve rising rapidly while the judgment curve is still flat. The peak of the curve suggests that this factor may exceed the "capability" curve. This becomes more likely when a very capable and aggressive student is matched with an inexperienced IP. Actually competition may exceed capability at several points in the program, for example the air combat maneuvering phase.



On this chart are plotted nine accidents involving pilot factor. As previously mentioned, these accidents are too few to have statistical significance. Black dots represent students fresh from UPT; gray dots are experienced pilot students. The most significant thing about this chart is that two of the accidents involving recent UPT graduates and four of those involving experienced student pilots occurred between the 10th and 31st course hour—in the wide portion of the capability-judgment gap.

in them an awareness of the need for a close student-IP relationship and the vital role the IP plays in the development of student pilots.

While this article was based on a study of a pilot training situation, the principles discussed apply to many training situations. For example, supervisors of automotive and special vehicle driver training would do well to ponder the charts presented here, and then look at their instructor force to determine how well they are filling their students' capability-judgment gap. ★

HORSE PLAY

LT COL SIDNEY T. LEWIS, USAF, MC, Directorate of Aerospace Safety

It has been traditional that a student pilot be dunked in water after his first solo ride. A large tub was provided for such an event. In Southeast Asia, this practice was carried even further. Crewmembers who completed their end-of-tour mission were greeted with water from various sources, most of it under high pressure. In two cases, the crewmembers, both pilots, were struck in the eyes by the high-pressure water. The ultimate injuries received resulted in their referral to the USAF School of Aerospace Medicine. Following ophthalmological evaluation, one pilot was permanently grounded and the other pilot was returned to flying status. These young pilots will require careful follow-up as the years go by since people with injury to the eyeball itself have a greater incidence of future eye problems such as glaucoma or detachment of the retina. It is truly ironic that these young men safely completed their combat tour only to have their fellow pilots unintentionally cause serious injury upon return from their last mission.

In a third case, the pilot upon return from his last mission was greeted by a gush of water from a fire truck hose. No one had thought about the fact that the water in the hose had been lying in the hot Southeast Asia sun for a prolonged period. He received painful burns from the hot water and was hospitalized.

No one intentionally causes these injuries and most people are sorry or ashamed when such things occur. A little common sense and thought could have prevented these injuries.

To paraphrase an old saying: "When we become adults, we must put away childish things." If ceremonies are required to celebrate an event, make sure they are safe! ★

ED. NOTE: We can vividly remember a cadet graduation party years ago when everyone was celebrating new silver wings. One 2d lieutenant didn't get a chance to use his. He hit his head on the edge of the pool when a friend's hand slipped during a heave-ho. He has never fully recovered.

LT COL D. D. JOHNSON, JR.
Directorate of Aerospace Safety



T-39 Engine Restrictions

Operations Supplement 1T-39A-1S-9 is self-explanatory as far as the procedures are concerned. However, for the T-39 driver, the Supplement does not tell us why the restrictions were imposed. This article will review past engine problems, proposals under consideration to correct known deficiencies and the effect of the present restrictions on operational flights.

From 1960 through mid-1970 there were 51 failures of the 9th stage blades in the J60-P3/3A engine. All of these failures involved steel blades. In July 1970, an ECP (2J-J60-546) was approved for a 9th stage titanium blade retrofit. The purpose of this retrofit was to eliminate blade failure caused by stresses which can occur at high rotor speeds. The engine manufacturer expected that the stress levels would be considerably reduced due to a change in vibration frequency of the new blade. This ECP was designed to alleviate blade failure since disk failures had not yet been experienced. As a precautionary flight procedure, the five minute restriction on MRT below FL 200 was also imposed on unmodified engines.

The first 9th stage disk failure occurred during a ground maintenance run in October 1971. Major airframe damage was caused by this failure. The second disk failure occurred in flight in February 1972. Pieces of the disk and blades tore a hole in the diffuser case; however, serious damage to the fuselage did not occur. Of these two disk failures, the first involved steel blades, while the second involved titanium blades.

Based on those disk failures, the manufacturer made nine recommendations. Seven of these concerned procedures for inspection, repair, assembly and test of compressors/engines and have already been implemented at the overhaul facility. The five minute time restriction on MRT for takeoff was the eighth recommendation. The ninth recommendation involved an engineering change which would provide improved air flow characteristics to the 9th stage blade area. Testing is currently in progress to evaluate this proposal.

How do these new restrictions affect the operation of the aircraft and what flight safety implications are involved?

- MRT is limited to five minutes for takeoff only. As far as takeoff performance is concerned, this restriction should present no problems. The previous five-minute limitation for operation below FL 200 has been deleted and MRT is for takeoff only. Figure 1 of Ops Sup 1S-9 provides the thrust settings for takeoff. Note that at temperatures below +12°F (−11°C) the thrust lines are flattened out. Therefore, to compute takeoff thrust at and below these temperatures, you must use the new charts. The J201 computer, if used in the *normal* manner will give a Pt 5 setting that will over boost the engine. However, the J201 computer can be used if a *constant* temperature of +12°F is used even though the takeoff temperature is colder than this.
- MRT is available at all altitudes for *emergency* use only and



ED. NOTE: The information presented in Operations Supplement 1T-39A-15-9, on the use of the J-201 computer, was written by Lt Col Johnson after the above article went to press.

Figure 2 of Ops Sup 1S-9 gives the thrust values. Note that at temperatures between −10°C and −20°C, depending on indicated mach number, the lines are flattened out. The net result is reduced Pt 5 settings. Again, the new chart must be used to obtain the proper thrust settings, as the J201 computer could provide higher settings than desired.

• Figure 3 of Ops Sup 1S-9 gives the NRT settings. Note here that the indicated mach number lines are flattened out below −30°C depending on mach. This chart should be used for computation on Pt 5 settings. However, the J201 computer can be used for all flight conditions when the free air temperature is *not* below −30°C. Below this temperature, the chart values should be used since the J201 may give higher settings than desired.

The above restrictions may be summarized as follows:

Do not use the J201 computer for takeoff MRT when the temperature is colder than +12°F.

Do not use the J201 computer for emergency inflight MRT settings when the temperature is colder than −10°C.

Do not use the J201 computer for inflight NRT settings when the temperature is colder than −30°C.

The San Antonio Air Materiel Area (SAAMA) has given this engine problem top priority and is working closely with the engine manufacturer. Both are well aware of the problem and the associated reduction in operational capability that the present restriction imposes. However, until additional testing and analysis are completed, we will have to plan our flights within the parameters given. Remember, the thunderstorm season is now in full bloom and these engine restrictions should influence our planning and inflight deviations. As additional information is gained, or changes are implemented to the present restrictions, you will be advised through normal channels. ★

HEY, JOE, WHICH WAY?

This story, if it were not true, would be amusing. However, it is being printed to salute everyone who has ever cussed, strained and moaned when time came to open a balky hangar door.

Early one evening a helicopter was parked in the hangar with the horizontal stabilizer protruding outside. One side of the hangar door was open and the other side partially open.

The night crew was directed to move the aircraft from the hangar to the flight line. To do so, the partially open door had to be opened all the way so the rotor blades would clear.

A crew was formed to move the helicopter. One of the wingwalkers later stated that he accidentally hit the door CLOSE switch. The result was as you suspect. The door struck the leading edge of the horizontal stabilizer. *But wait? There's more.*

When activating either of the control boxes, in OPEN or CLOSE mode, it was anyone's guess as to which door would move—due to a short in both boxes. If that wasn't confusing enough (would you believe) the instructions printed on the control boxes were vague. The 3-position switch was mounted in the box below the instructions: OPEN on the left and CLOSE on the right. In neutral, the arm of the switch was at the 9-o'clock/3-o'clock position. To open the door, would you rotate the arm clockwise to OPEN or counterclockwise toward CLOSE? The way it was rigged, the correct way to open the door was to move the switch counterclockwise away from OPEN toward CLOSE.

If you're confused trying to follow the narrative, imagine the maintenance troops!

Since the incident report did not address the problem, it is not known how long this screwball lashup had existed. You can bet there was a heap of scurrying around to correct the defects. ★

(US Navy APPROACH)

OXYGEN QUICK-CHECK

LT COL THOMAS J. McNEY
Chief, Physiological Training, George AFB, California

For those who fly, the words P. D. McCripe and PRICE are familiar sounds. Over the years they have served to remind aircrew members of a step-by-step procedure for checking aircraft oxygen equipment.

P. D. McCripe became popular in the 1950s and stands for Pressure, Diaphragm, Mask, Connection at mask, Connection at regulator, Regulator, Indicator, Portable oxygen equipment and Emergency oxygen equipment. It is an equipment check still used on multi-place aircraft where portable oxygen equipment is employed.

The PRICE check became popular in the 1960s and stands for Pressure, Regulator, Indicator, Connections and Emergency oxygen equipment. It is essentially a check on the aircraft oxygen system; it assumes that the mask and helmet have already been checked. PRICE is currently used for aircraft not equipped with portable oxygen equipment.

In the 1970s, with the development of quick checks for other aircraft systems, a similar quick check for oxygen equipment has become practical and popular. It is a quick check for proper functioning of the principal oxygen system that the crewmember relies on: the mask, the automatic regulator, integrity of connections and the aircraft oxygen system itself. The check is simple, logical and requires no "artificial" method of remembering what to do. It's a very thorough check, yet it takes only a few seconds to perform. No matter how pressed for time one might be, there should always be enough for a quick oxygen check.

Here's how to do it:

- Make sure your regulator is turned on, attach your mask and adjust it for a firm face seal, turn the regulator to 100 percent oxygen and the pressure setting to Emergency. Check the quantity and pressure indicators.
- Take a few breaths. Observe the proper function of the oxygen flow indicator. Be alert for the foul odor characteristic of a contaminated oxygen system (an extremely rare occurrence).
- Take a breath and hold it, observing the flow indicator. This simple act is a leak test of the entire system. If you're not breathing, there should be no flow and the indicator should stay black.

The quick check will instantly disclose much of what can go wrong with an oxygen system. For example, it can reveal an automatic oxygen regulator inadvertently turned off. When the regulator is set for 100 percent and pressure breathing, one cannot inhale if the regulator is turned off. The danger with a regulator turned off lies in the fact that the user can breathe normally, as if he were getting oxygen, to cabin altitudes above 20,000 feet. If he doesn't notice the position of the switch or the absence of the "blinker," the first warning he gets may well be his symptoms of hypoxia. Of the cases of inflight hypoxia reported in recent years, a significant number were caused by the regulator being inadvertently turned off.

The quick check can also reveal an improper mask fit. It can find an unseated microphone, an improperly installed inhalation/exhalation valve, or a hole in the mask, the mask hose or the CRU-60/P connector. It can disclose an improper connection at the quick disconnect to the regulator hose or a missing white rubber gasket on the CRU-60/P connector. It can detect a hole in a regulator hose, a loose hose connection at the regulator, or a bad regulator diaphragm or airscreen.

All the malfunctions mentioned have figured prominently in documented hypoxia incidents. All of them could have been prevented by applying the quick check procedure.

The quick check is quite adaptable. It can be used with the tester in P.E. and save an abort because of bad personal equipment; it can also be used as an inflight check when the mask is re-donned after momentary removal—although it is important to remember to return the automix lever and pressure settings to normal afterwards, to avoid unnecessary depletion of oxygen supplies.

One held breath—a few seconds of your time—and you protect yourself against almost everything that can go wrong with an oxygen system. A quick check is essential to oxygen discipline; and oxygen discipline is essential if bad equipment or bad connections are to be discovered in time.

If you aren't now using some simple quick check of your oxygen system, try this one. It's a good investment! ★

REX RILEY'S CROSS COUNTRY NOTES

876-2633 AUTOVON

Direct Contact. One of our transient pilots made the point that he did not feel that it was possible for him to realistically evaluate the transient facility. Generally speaking, you complete the questionnaire (if there is one) before you return the bird. Then if something goes haywire, it's just too much trouble to unstrap and head back across the ramp to Ops to file the complaint. I agree with him and this is why we have encouraged transients to call Rex direct on autovon. At the top of this column is the phone number that will put you in contact with us. When you call, we'll take your complaint and put it into the file. Don't hesitate when you have a suggestion you feel will help make our traveling easier.

Not the Regular Crew Chief. A Code 7 friend of mine called the other day with a gripe about service he had received while on cross-country with a fighter. Seems that there was a maintenance problem with his bird and rather than continue on that afternoon he decided to RON and get it fixed. He told the duty NCO about the malfunction and proceeded to his quarters. The next morning he filed and proceeded to his airplane only to find that the discrepancy had not been cleared. Marching into transient alert, he asked why the repairs had not been made. The answer was that, "We changed shifts last night about the time you left and I guess that it didn't get passed on." Come on, guys. You've got to have some system to insure that this doesn't happen. You have a system, don't you?

Why Bother??? Since it's impossible for me to personally visit every base in the Air Force, we asked and received some help from the Unit Effectiveness Inspection teams. They supply me with an informal report on some of the activities that they can find time to look at. The evaluations are not used in any way in the formal report; it's just to help me to get a handle on some of the problem areas. The comment that interested me was that "Base Ops doesn't take timely action on complaints about air traffic control problems." To me this is the heart of the whole system. Why bother to ask for comments from transients if you're not going to take action or even read them? Does your Base Ops have a system to insure that all the valid complaints are resolved? Also, when a transient says he got super treatment, are you in a position to pat somebody on the back? If not, you're missing a good management tool.

A Little Extra! When the forecaster at Richards-Gebaur handed me back my completed weather briefing, I noticed that in the comments section were some station identifiers with UHF frequencies. Seems that this weather squadron section takes time to evaluate your route and gives you a ready reference for pilot to forecaster service. A nice touch. It shows that they are interested in your welfare. Nice work, R-G. ★



REX RILEY

Transient Services Award

LORING AFB	Limestone, Me.
McCLELLAN AFB	Sacramento, Calif.
MAXWELL AFB	Montgomery, Ala.
HAMILTON AFB	Ignacio, Calif.
SCOTT AFB	Belleville, Ill.
RAMEY AFB	Puerto Rico
McCHORD AFB	Tacoma, Wash.
MYRTLE BEACH AFB	Myrtle Beach, S.C.
EGLIN AFB	Valparaiso, Fla.
FORBES AFB	Topeka, Kans.
MATHER AFB	Sacramento, Calif.
LAJES FIELD	Azores
SHEPPARD AFB	Wichita Falls, Tex.
MARCH AFB	Riverside, Calif.
GRISSOM AFB	Peru, Ind.
CANNON AFB	Clovis, N.M.
LUKE AFB	Phoenix, Ariz.
RANDOLPH AFB	San Antonio, Tex.
ROBINS AFB	Warner Robins, Ga.
TINKER AFB	Oklahoma City, Okla.
HILL AFB	Ogden, Utah
YOKOTA AB	Japan
SEYMOUR JOHNSON AFB	Goldsboro, N.C.
ENGLAND AFB	Alexandria, La.
KADENA AB	Okinawa
ELMENDORF AFB	Alaska
PETERSON FIELD	Colorado Springs, Col
RAMSTEIN AB	Germany
SHAW AFB	Sumter, S.C.
LITTLE ROCK AFB	Jacksonville, Ark.
TORREJON AB	Spain
TYNDALL AFB	Panama City, Fla.
OFFUTT AFB	Omaha, Nebr.
McCONNELL AFB	Wichita, Kans.
NORTON AFB	San Bernardino, Calif
BARKSDALE AFB	Shreveport, La.
KIRTLAND AFB	Albuquerque, N.M.
BUCKLEY ANG BASE	Aurora, Colo.
RICHARDS-GEBAUR AFB	Grandview, Mo.
RAF MILDENHALL	U.K.

RESPONSIBILITY

Most of us go about our daily routine with a great deal of complacency and seldom give a conscious thought to safety. We are so sure we are safe that we are not self-critical of our own actions. Suddenly, when we least expect it, we have a near disaster. Then we stop and ask ourselves, why? In most instances we find that the cause is either a misunderstanding or lack of knowledge of a procedure we have been using as a matter of routine. We know that we are not going to deliberately commit an unsafe act; that we are going to carry out our responsibilities; and we trust that the other guy will also. That is the key to this article. What are the other guy's responsibilities? Do you really know where his responsibility ends?

In most cases, I think an honest answer would have to be "I'm not sure." How about traffic advisories; both to VFR and IFR aircraft? Are you aware of both the controller's responsibility and your responsibility as a pilot? I hope so, but let's review a specific case which occurred while my crew was on duty in a Radar Approach Control facility.

A MAC C-141 was handed off from the center to Approach Control at 8000 feet enroute to the fix serving the airport where he intended to land. Radar contact was established, weather, traffic, and airport information was given to the pilot on initial contact. The weather was perfect: one of those beautiful starry nights with endless visibility and not a wisp of a cloud in the sky. The pilot requested clearance to descend in the holding pattern to the initial approach altitude and execute an ILS approach. His request was approved by the controller, who had only one other aircraft under his control at the time. A civil DC-4 flying VFR through the area had requested VFR traffic advisory service. The DC-4 was radar identified and since his route of flight would take him to the vicinity of the holding fix, traffic information was passed to both aircraft. Both pilots were advised of the position, distance, altitude and intentions of the other aircraft. Both pilots acknowledged the information and reported having their traffic in sight. The civil aircraft continued on the same heading and the C-141 continued to descend. Neither pilot took evasive action and a near miss resulted. The C-141 pilot filed an OHR against the controller for failure to provide him with separation from a VFR aircraft.

In the investigation that followed the C-141 pilot stated that he was not aware of his obligation to operate on the "see and avoid" concept as required by paragraph 67A of FAR 91. He stated that he was governed by AFM 60-16 and not Federal Air Regulations. He further stated that he thought the controller had to separate him from all traffic both IFR and VFR.

I was very fortunate in that I had an ex-C-130 pilot who was cross-training into Air Traffic Control on my crew for his checkout in the facility. He stated that he felt sure that most pilots shared this same belief. As a result, the two of us stopped by Base Operations and MAC ACP and asked about a dozen pilots who came in to file Flight Plans if they were aware of their



MSGT GEORGE V. STRICKLAND, 1962 Comm Gp, APO San Francisco 96239



obligation under FAR 91.67A. (Ed. Note: We probably would have answered the question in the same way as those pilots questioned. Since Air Force regs are almost always more stringent, we seldom if ever refer to the FARs.)

The standard answer was "No." Of the pilots we questioned, only one answered in the affirmative.

This points out one thing. The Air Force instrument training program and flight supervisory personnel need to place additional emphasis on FARs and the responsibility of Air Force pilots to comply with them. (Ed. Note: We have constantly stressed the importance of "See and Be Seen." Hopefully, all our pilots know that when you can see out of the windscreen it's time to "look out." The only time you can afford to keep your eyes in the cockpit is when you're in weather and can't see out.)

The Air Force made what I feel is a very good effort to combine the most commonly used FARs into AFM 60-16. However, AFM 60-16 is not a duplicate of every paragraph of the FARs, and each pilot should expend the time and effort to become thoroughly familiar with FARs, paying particular attention to such areas as Right of Way and Lost Communications procedures. To help clarify any misunderstanding of an Air Force pilot's responsibility to comply with FARs, paragraph 1-1c of AFM 60-16 clearly states that Air Force aircraft are governed primarily by FARs and nothing stated or implied in AFM 60-16 relieves the pilot of his responsibility under FARs.

The controller is required to provide traffic advisories to IFR aircraft, and traffic advisory service may be provided for VFR aircraft on a workload permitting basis. However, advisories provided by a controller are only *advisories*. They are for your information and to assist you in locating other aircraft whose path of flight may conflict with yours. It does not mean that the controller is going to provide separation between your aircraft and the other observed target. Separation is provided only between known IFR traffic. The controller can vector an IFR aircraft clear of other observed targets but only if the pilot requests this service and the aircraft to be vectored is in the controller's area of responsibility.

Too many pilots assume that when a controller states "Radar Contact" they are home safely. They seem to feel like they have a shield of protection around them and the controller is going to keep everybody else out of their little world. Nothing I can think of is a more grave misconception. I have heard crewmembers say that when the controller states "Radar Contact" there is an audible sigh of relief in the cockpit. As an Instrument Rated Flight Instructor I know how sweet the words "Radar Contact" sound, but don't let those two little words ever lull you into a false sense of security. The controllers will assist you in any way they can to help make your flight a safe one; but when you are flying in VFR weather conditions, the responsibility for separation from other aircraft rests with you, the pilot—without regard to the type of flight plan you are on. The controller will provide you separation from known IFR traffic only. ★

MULTIPLE MALFUNCTIONS

Every pilot and maintenance man who has even a few months' experience has had the admonition "Use TO procedures" beaten into his head until one would expect callouses on his brain where such things register. The point of this article is to emphasize the critical need to use systems knowledge to recognize and handle problems when step-by-step flight operating procedures or maintenance troubleshooting procedures fail to achieve expected results. Multiple malfunctions are infamous for lousing up standardized troubleshooting procedures.

To illustrate the point, we are going to discuss a very troublesome maintenance problem that occurred at an ATC base as reported in an Unsatisfactory Material Report. The discussion is admittedly "Monday morning quarterbacking" in the classic sense; reference to the specific case is only to illustrate how troublesome multiple malfunctions can be when detailed systems knowledge is absolutely essential in solving a problem. The people actually involved with the problem handled it and probably used the techniques under discussion.

The first indication of the problem occurred in flight when the gear handle was lowered for the third landing pattern. The gear did not come down; the red light in the handle came on and the warning horn sounded. The pilot attempted to recycle the gear handle but it was "stuck" in the down position. Mobile Control observed the gear up and the gear doors open. It is assumed hydraulic pressure remained normal.

We now have strong, but not quite conclusive, evidence of multiple malfunctions. Considering the systems involved, it looks like this:

1. Gear doors opened normally, warning light circuit normal; but the gear handle is stuck. What's the problem?

2. Normal procedure would be to recycle the gear control lever, but it is stuck. The most likely thing to stick the gear lever in the down position is the solenoid lock and its associated circuit that helps prevent gear retraction with weight on the wheels. If a check of the override button shows it frees the control lever but the gear still does not go down, we definitely have multiple malfunctions. We know the landing gear lever solenoid circuit is malfunctioning, but that wouldn't keep the gear up. What next?

3. All three gears are up. It can't reasonably be a mechanical problem in the gear actuating mechanism as each gear has its own independent mechanical system. Electrically, it could be a simple open circuit, a fault in the landing gear door open indicating switches (either switch function or rigging), a malfunctioning set of contacts in the gear control handle or a problem in the gear actuating hydraulic valve solenoid. Hydraulically, possibilities are pretty well limited to the gear actuating hydraulic valve. In any case, the alternate release system is the thing to try.

4. Now, gear handle down—check. Pull the alternate release—The gear goes down—three green lights. Remember, no nosewheel steering is available after lowering the gear with the alternate release unless the system is reset. It doesn't matter; the problem belongs to maintenance now.

Now the maintenance men recognize the presence of more than one malfunction and take action. A broken wire is found and repaired on the left main gear strut switch. That will keep the gear lever from "sticking" in the down position with no weight on the main gear. The right main landing gear inboard door sequence switch is adjusted to solve the problem of the gear failing to come down normally, and the system checks out okay. Later events indicate that either the door sequence switch adjustment was one of the three simultaneous malfunctions or it was not a factor in the inflight situation. Of course, even if it was not a factor, it may have been in need of adjustment.

Two weeks after the first incident, a pilot wrote up the aircraft for inoperative nosewheel steering. A ground taxi test and operational check failed to show a defect. After two more days, another case of inoperative nosewheel steering was reported. At this point, in good Monday morning quarterbacking technique, it can be pointed out that the history of the aircraft in having the gear fail to come down plus two cases of nosewheel steering failure could have led to the conclusion that the gear actuating hydraulic valve might be malfunctioning. This is because the hydraulic pressure for lowering the gear and for nosewheel steering come through that valve. However, troubleshooting procedures in TO 1T-38A-2-8 for nosewheel steering failure do not include checkout of the gear actuating hydraulic valve, so the steering actuator was changed. Incidentally, the removed actuator was subsequently bench checked and found okay.

Another day—another steering failure. Finally an intermittent open circuit was found in the gear down solenoid of the landing gear actuat-

ing hydraulic valve. Replacement of the valve apparently cured the last of a series of two or three simultaneous malfunctions. A recommendation for inclusion of the landing gear actuating hydraulic valve in the checkout procedure for steering failure was submitted.

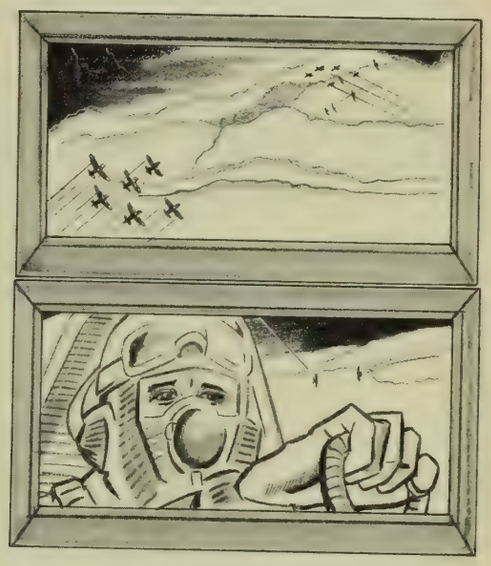
In summary, use your TO procedures. In addition, while you are using them, relate the procedures to your knowledge of the aircraft systems and how the systems work. Whenever the procedure doesn't seem to give satisfactory results, a little more system analysis may put you on the right track. It is the multiple malfunction that can't be fully anticipated in writing TO procedures that can give you serious problems, either in flight or on the ground. ★

(Northrop *Talon Service News*)

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EPILOGUE of a FLIGHT SAFETY OFFICER

MAJ RALPH T. LASHBROOK
67th Tactical Reconnaissance Wing, Bergstrom AFB, Texas



In a few days I'll hang up my flying gear for the last time. But before I do I want to get in one last plug for my company product—Flight Safety.

During my military flying career I have been catapulted off aircraft carriers in the back seat of SB2C "Helldivers;" photographed atomic bombs at Bikini through the waist gun ports of PBM "Mariners;" slid off the runway in a T-6 "Texan;" saw three classmates collide as their four-ship T-33 flight turned onto initial at Willy Air Patch; flamed out during landing roll in an F-86E at Nellis because of poor fuel management; made a gear up landing in an F-89 at Scott because of materiel failure; missed a head-on collision by less than 100 feet when the other jock forgot to check a runway change; almost lost an RB-66 south of Cuba in a violent tropical thunderstorm; and snagged the midfield barrier at Udorn after a utility failure. Do I know about flight safety? You bet your bippy I do.

I have seen the flying game move from relatively simple machines to highly complex integrated weapons systems and aircrews progress from devil-may-care flying fools in 50 mission crush caps and long white scarfs to highly skilled airmen in pressure suits and fish-bowl helmets. Hold on, before you old timers get up in arms about being called 'flying fools', there were professionals in WW II (the big one) just as there were in the Spads and the Nieuports and there are in the Thuds and the Phantoms.

In my association with military aviation from 1944 to 1972 I have had many satisfying experiences. If asked to select one above all the others, I would have to say my assignment as Flying Safety Officer was the most gratifying experience in my aviation career. Flying will always hold a special place in my memories but that was primarily due to the efforts of myself and my crew. A good flying safety record is possible only through the combined efforts of everyone associated with flying operations: the approach controller, the crew chief, the dispatcher, the flight engineer, the flight surgeon, the navigator, the operations officer, the pilot, the systems specialist, the tower operator, the weather forecaster, the commanders, and many many others.

As I put my hard hat on the shelf for the last time, I would like to thank each and every one of you who, as true professionals, have made my assignment as Flight Safety Officer a very pleasant high point of my military career. May all your days be CAVU, your nights starlit, and your sunsets golden.

FLY SAFE

Ops topics

INLET GUIDE VANE ICING

An air carrier flight experienced an unusual circumstance in which approximately half an inch of ice accumulated on the inlet guide vanes during ground idle. The weather was clear and the temperature 25°F. The taxiways, however, had been chemically treated to melt a covering of ice and snow. This created a very thin layer (not more than one foot) of fog, not considered as visible moisture in the usual sense. During extended idle, enough of the moist air was drawn into the engine intakes to cause the ice buildup. Fortunately the flight returned to the ramp where this condition was discovered.

(Flight Safety Foundation Bulletin)

REUNION

The annual reunion of the 36th, 49th and 50th Tactical Fighter Wings will be held at the Union Plaza Hotel in Las Vegas, Nevada, 6-9 October (3-day holiday weekend). Request all present and former members send current addresses to P.O. Box 9766, Nellis AFB, Nevada, 89110; or telephone Project Officer, Col "Dag" Damewood.

OV-10A FACs

1st Bronco Reunion, Hurlburt Field, Fla.

6-7 October 1972

For info write: Bronco Reunion, Box 517,

Mary Ester, Fla. 32569

LOW SLUNG

The F-4 pilot was returning to his home base after an extended TDY on the other side of the country. The aircraft had been loaded by the home troops and was configured with two external drop tanks plus a TER on each inboard pylon with a BLU-1 baggage pod mounted on the bottom station of each TER.

On takeoff, as the bird passed over the approach end BAK-12, the aircraft swerved to the right. The pilot got the bird back under control and continued the takeoff. Shortly thereafter, tower passed the word through departure control that the F-4 had left numerous objects on the runway.

Suspecting a ruptured or open baggage pod, the pilot dumped fuel and lowered the landing gear—and immediately experienced utility hydraulic failure and an unsafe nose gear indication. An inflight check confirmed that the nose gear was trailing at 45 degrees, the right baggage pod was ruptured and the right main tire was shredded, possibly blown.

The pilot actuated the emergency landing gear system, the nose gear indicated down and locked and the utility hydraulic pressure came back. The bird was recovered with a routine approach-end bar-

WAKE TURBULENCE

Recently a twin engine lightweight utility aircraft, belonging to a sister service, was conducting a precision approach to an Air Force base. The final controller issued a landing clearance and advised him he was number two behind a C-130. The aircraft was observed going below the glide path, and at one and one-quarter miles from touchdown was told he was too low for a safe approach and was issued go-around instructions. The pilot replied, "Okay, Roger; we're trying to stay under the C-130's wake turbulence."

The aircraft then entered a violent, ninety degree, nose down bank at about 150 feet above the ground. Power was applied and luckily the aircraft responded. After landing, wheat stalks were removed from a wing of the aircraft.

Apparently, this pilot was not aware of the approved procedures for avoiding wake turbulence. Remember, don't fly behind and *below* a large aircraft on final approach. An *above* and behind position should help avoid this hazard!

Hq AFCS
Richards-Gebaur AFB, Missouri

PHANTOM

rier engagement. The shredded tire didn't blow.

Examination of the runway, the aircraft and the barrier disclosed that the barrier cable had snagged the right baggage pod on takeoff roll and ruptured it. Two hundred feet past the cable, one of the gear down locks fell from the ruptured pod and was run over by the right main wheel, cutting the tire tread. A little later, probably during gear retraction the tread separated from the tire and a piece of rubber impacted and severed the landing gear down hydraulic line. When the gear was lowered and the line was pressurized, the severed line resulted in utility system failure. Actuating the emergency system isolated the severed line and there was sufficient fluid remaining to let the system build back up to normal pressure.

Primary cause of the flub-up was laid at the feet of the people who loaded the bird. Seems that the bottom TER station is not authorized for the BLU-1, since it results in only five and one-fourth inches of ground clearance—certainly not enough to clear a barrier cable rebounding from the nosewheel.

But we have to wonder about the aircrew not noticing a little thing like that.

FLIP CHANGES

High Performance Aircraft in Terminal Areas—"Keep-'em-High": The FAA has initiated a program known as, "KEEP-'EM HIGH." Arriving IFR high performance aircraft will be kept at the highest possible altitude as long as possible. Departing high performance aircraft will be climbed to the highest possible altitude filed by the pilot as soon as possible. The program is intended to reduce the mixture of aircraft in the vicinity of the airport. This program is also intended to provide noise relief to the community surrounding the airport. Details on "KEEP-'EM-HIGH" have been published in FLIP Planning Section II North/South America Special Notices section.

ONE MORE TIME

Shortly after starting the takeoff roll, the Nr 1 fuel flow on the T-39 fluctuated and dropped 500 pounds. The pilot aborted early—about 50 knots.

He made a run-up on the taxiway after the abort and everything checked normal, so he taxied back for another try at it. Everything was go on the second try until about 70 knots, when the symptoms recurred, and the pilot aborted again. Time between the aborts was about 13 minutes.

Finally getting the message, he was taxiing back to the ramp when the right main tire blew out. The aircraft was shut down and the fire department called.

The fuel flow problem was due to failure of the fuel flow transmitter. The tire failure occurred when excessive heat built up and ruptured the sidewall. Both wheels were checked out during teardown and no discrepancies were found.

We marvel at some people's persistence. Darned few parts of an airplane are self-healing, and when a malfunction serious enough to call for an abort crops up, that same prudence which dictates the abort *should* dictate taking the bird back to maintenance.

THE LEMMING EFFECT

After takeoff, the pilot made several attempts to raise the gear, but the handle wouldn't move out of the "down" position.

Did the pilot call immediately for a closed pattern, maintain airspeed below gear-down speed, return and land so that maintenance could clear the malfunction?

Sorry, no. The pilot, like a lemming rushing to the sea, was locked onto a course of action and wouldn't break lock. ("By God, after takeoff the gear's supposed to come UP!")

He turned out of traffic and gave it another try. This time the handle came up and the gear started to retract. Before the retraction was complete, however, the gear handle fell back to the down position. The gear went back down—almost. Two green and a nosewheel barber pole. Another aircraft confirmed the nosewheel partially extended.

Now nothing worked. The gear handle was frozen. Emergency gear extension had no effect. Putting G on the bird, yawing violently, repeated touch-and-goes,—nothing helped.

Having tried everything, there wasn't much left to

do but bring it in. The pilot bored holes for a little while, burning off fuel while the runway was being foamed, then made a nice landing on the mains and, after he'd slowed down, on the extended speed brake.

We were fortunate in that aircraft design prevented an incident from being a major accident. But no thanks to the operator.

It would have been a lot more professional to accept the fact that the cockpit is a lousy place from which to perform maintenance. The proper environment for gear retraction tests is the hangar.

PREVENTION IN ACTION

The C-130 was on a low-level drop mission, and had just completed a troop drop. The loadmaster was retrieving the static lines, when the retriever cable attached to the winch snapped, sending approximately ten feet of cable and the retriever spool whipping back toward the loadmaster.

The loadmaster wasn't injured. But the helmet and face shield he was wearing took a beating!

Why was he wearing a helmet and face shield? Because several months ago another loadmaster was fatally injured during a similar airdrop accident. He wasn't wearing any protection. The investigation concluded with the recommendation that a helmet and shield be required, the command acted on the recommendation, and the protection was subsequently available when it was needed.

Thoughtful recommendations from the accident investigators; quick implementation by command; and ready acceptance by the user saved at least one man—and probably more—from serious injury.

We wonder how many people were aware of the potential for an accident before the *first* one happened . . . and took no steps to prevent its occurrence. Now that we know, there is no excuse for not using the protection. It can save lives!

TRAINING PAYS OFF

Every once in awhile, something comes across the desk which makes all the preaching seem worth while. The following is printed verbatim from a report on a fighter aircraft which lost power and crashed short of the runway.

"The ballistic timer of the automatic parachute deployment system did not fire due to a bend in the arming cable pin. This failure negated the entire automatic deployment sequence. The action of the pilot of manually pulling his 'D' ring deployed the parachute. The effective life support training given to the pilot prepared him to successfully accomplish the low altitude extraction in spite of system malfunction.

"The Instructor Pilot's timely decision to abandon the disabled aircraft was the primary factor in the totally successful recovery of both aircrew members."

OFF-COURSE GUIDANCE

If the airplane you fly has 50KHz separation on the VOR receiver—if it's possible to dial in, say, 117.65 when what you want is 117.6—look out! If you make a mistake and tune your receiver 50 KHz off the intended frequency, the possibility of an erroneous course indication exists.

The indication produced can appear to be usable. Station identification may be heard, the off-flag may be absent, a course indication may be displayed. But the course indication will probably be near the 180 degree radial (from), or its reciprocal 360 degrees (to), and will not vary as the aircraft moves past the VOR ground station.

With 50 KHz separation, the old "tune and identify" rule isn't enough. Always perform a visual check of the frequency selector to make sure the correct frequency is dialed in, and be alert for the symptoms of 50 KHz detuning described above. ★



Toots

is interested in your problems. She spends her time researching questions about Tech Orders and directives. Write her c/o Editor, Aerospace Safety Magazine, AFISC, Norton AFB, CA. 92409.

Dear Chief

I talked with the people at AFLC who wrote the book. They agree with you that paragraphs 3-19 through 3-21 pertain to equipment (black boxes) awaiting service, repair, inspection or storage. They do not apply to in-shop test or mockup equipment that is used daily in the performance of the job.

I might add that such test or mockup equipment should *be secured, covered and protected in accordance with the appropriate handbook for that equipment.*

Toots

Dear TOOTS

I am concerned about the intent of paragraphs 3-19 through 3-21 of TO 00-25-234. I believe these paragraphs were intended to address the problems of transporting and storing equipment, and do not apply to electronic gear which is kept in one place and is available for use on a daily basis. For example, if I follow the letter of the paragraphs, I should seal off and pack (in a suitable container) the oscilloscope in our electronics shop whenever it is not in use.

Please don't read me wrong. I believe in protecting valuable equipment. But I don't want to have to cover the 115 VAC wall outlets with a plastic cap just because someone missed the intent of the TO.

CMSgt Sherrell L. Smith
18th Avionics Maint Sq
APO San Francisco 96239

Dear Troops

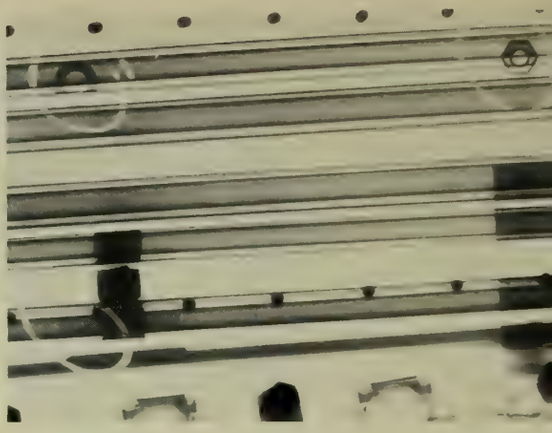
Although the staff of *Aerospace Safety* spends lots of their time reading about, talking about, and writing about maintenance malpractices and deviations from tech data which adversely affect the aircraft accident rate, we continue to be impressed with the really high quality of maintenance work being accomplished. Month after month we place the spot light on bad maintenance, misuse of tech data, carelessness, goofs—but these things are the exceptions. The idea is that everyone learns from mistakes, his own or someone else's, so we publicize more of the bad than the good.

We trust our readers realize that the bad is not representative of the entire maintenance complex.

Toots



1



1a



1b

LT COL ARTHUR W. DAY
4th Tactical Fighter Wing
Seymour Johnson AFB, N.C.

NDI-FOD

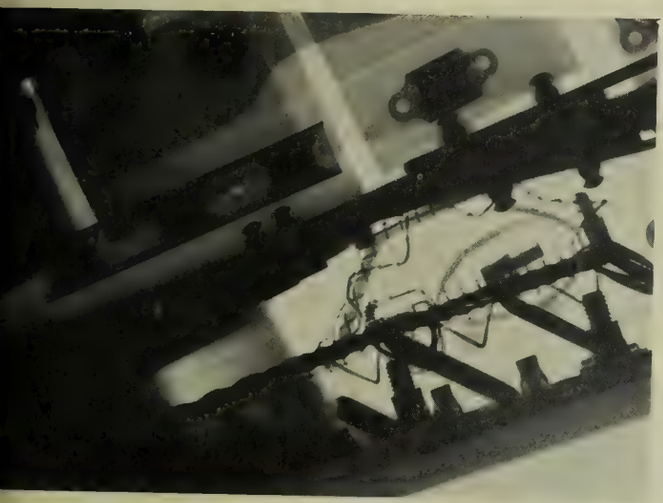
WEAPON IN FOREIGN OBJECT CONTROL

The 4TFW recently experienced an unusual number of engine FOD incidents, which led to an intensive search into all aspects of FOD causes and prevention. Several findings turned up that should be of interest to all F/RF-4 units.

Through the use of NDI X-ray procedures (radiographic inspection), this wing discovered numerous small objects located under the protective shield that covers hydraulic lines in the bottom of each engine



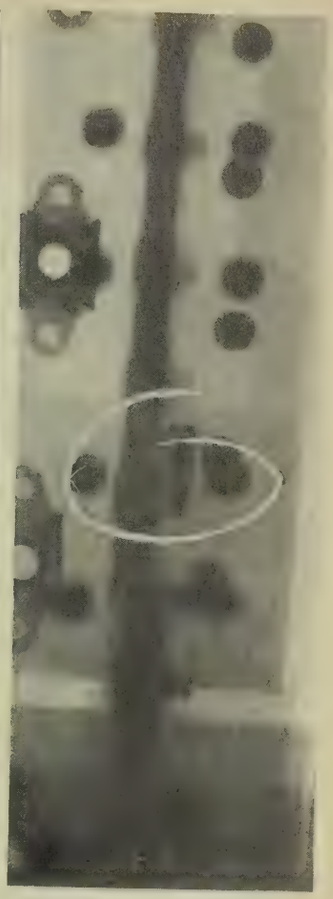
2



2a



3



3a

bay. Photo #1 shows SSgt Richard Smith aligning X-ray tube head for shooting bottom of engine bay. X-rays from different aircraft revealed a washer, nut and heavy safety wire under hydraulic lines (Photo 1a) and a hidden brake pin and heavy safety wire (Photo 1b). Photo #2 shows SSgt Ernest R. Brothers placing the X-ray film and TSgt James K. McDonald aligning the tube head prior to exposure. The exposure, Photo 2a, revealed a loose Jo bolt.

By making exposures at different angles, once a foreign object is discovered its location is pinpointed using polaroid film. Photo #3 shows polaroid film placed in air intake and X-ray tube shooting up. Resulting exposure, Photo 3a, pinpointed the Jo bolt between the intake inner and outer skin.

By visual inspection, foreign objects (washers, clips, cotter pins, safety wire) have been discovered in the crevices below the centerline split panel cannon plug seal assembly where the centerline tank electrical lead goes through the left engine bay. Most of our FOD has occurred in the left engine and the majority of foreign objects discovered during X-ray has been in the left engine bay area.

Analysis has shown that most FOD is a result of:

• Remnants left from the recent 2147 Program. The majority of this work occurred in the left en-

gine bay and variable ramp area.

• Carelessness of personnel performing maintenance or training which required removal of the centerline split panel cannon plug seal assembly.

• Loose screws being placed in the exterior boarding step wells.

• Foreign objects which cannot be removed without removing a protective shield assembly above and aft of doors 74L & R.

In response to these findings, the 4TFW has taken the following actions:

• Established a requirement that all aircraft variable ramps and protective shield areas be X-rayed and any foreign objects removed prior to the next flight.

• Established a requirement that the protective shield discussed in Paragraph 2 be removed and the area below inspected and vacuumed at engine removal (AFTO Form 22 has been submitted to include this requirement in TO Work Cards 1F-4C-6WC-4).

• Emphasized importance of performing thorough and accurate engine variable bypass bellmouth inspections anytime an engine is removed.

• Visually inspected all aircraft for proper installation of centerline split panel cannon plug seal assembly; examined the crevice area below it and all boarding step wells.

• Formed an FOD Investigation Team (similar to the Flight Control Team) for continuity of FOD investigations.

• Formed a special intake inspection team to inspect aircraft prior to each flight subsequent to aircrew's arrival for preflight.

• Include boarding step foot wells on crew chief's preflight inspection (AFTO Form 22 has been submitted to include these boarding step areas).

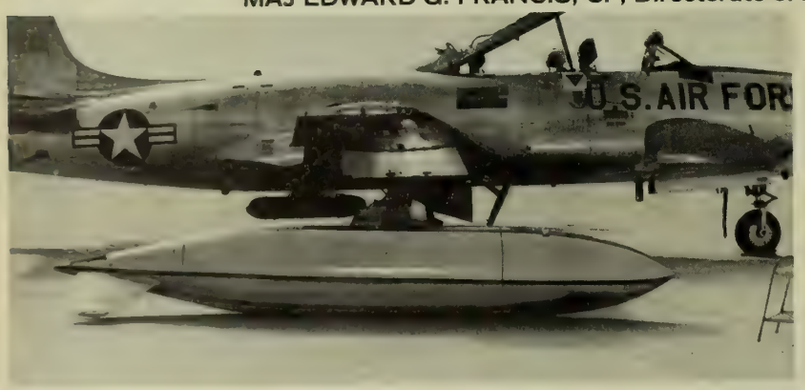
• Placed additional emphasis on insuring that all personnel who work on or around the F-4 are properly educated and trained in detection and prevention of FOD. Sample X-rays have been included in this education process.

Inspection of 28 aircraft revealed that 12 of them contained potential FOD. Ten of the 12 discoveries were in the left side of the aircraft.

Collection and analysis of data will be continued in order to surface additional trends which may identify origins of FOD contamination. ★

THE "IF-YOU-DON'T-KNOW-HOW-IT-WORKS-LEAVE-IT-ALONE" DEPARTMENT

MAJ EDWARD G. FRANCIS, CF, Directorate of Aerospace Safety



Although this story involved a T-bird, the lessons to be learned apply to all of us. It is another incident that shouldn't have happened. Our thanks to the drafter of the incident report, from which much of the narrative was lifted.

The aircraft landed away from home base with a fuel venting problem which was traced to a leak near the right tip tank disconnect area. Two technicians began to investigate the problem. One removed the tip tank jettison access panel and decided he needed a torque wrench and adapter to check the torque on a nut. The other found he needed a speed screw driver to facilitate removing the tip tank fairings. Both technicians left the aircraft to get the tools.

Meanwhile, the pilots returned to the aircraft to see how the repair was going. The AC jumped up on the wing, walked to the end and proceeded to explain to the other pilot how the jettison system worked, although as he admitted later, he did not understand it. He picked up the tip tank pin which was lying on top of the wing, inserted it into the arm of the tip tank hook release lever, and then removed it. He then grasped the arm and moved it sideways, causing the tank to jettison (as advertised). Unbelievable? But true!

Most of us are drawn to open panels on airplanes to see what makes things go; there is nothing wrong with a healthy curiosity. We must, however, remember to "look, but don't touch." Obviously, in this case, the pilot had no business tampering with a system which he did not understand; therefore, pilot factor was the primary cause of this incident.

Although they could not have foreseen what would happen, the technicians should not have left the aircraft unattended with the tank jettison mechanism uncovered and the safety pin removed. They were right not to have attempted to insert the pin with the access panel off because of the chance of jettisoning the tip tank, but one of them should have stayed to guard the area. That might have prevented the incident. ★

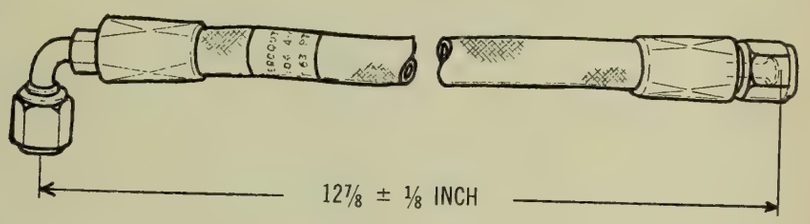
Tech topics

briefs for maintenance techs

T-37 NOSE GEAR HOSE

NOTE
MEASURE HOSE LENGTH FROM CENTER LINE OF 90° ELBOW TO END OF FLARE INSIDE OF NUT.

CAUTION
The method of measuring and the length of the new hose assembly is very critical; insure close quality control.



In spite of specific instructions and the caution note in TO 1T-37-B-2-3, maintenance personnel continue to deviate from the tech order when installing this critical item of the landing gear system.

In this incident the gear handle would not lower to the full down position. The student pilot went around with the gear handle stuck in the intermediate position, but after the handle was worked a few times, it went to the down position. But only the nose gear extended. Hydraulic pressure was observed at 300 psi. The emergency extension system was activated and the mains went down and locked.

A 13¼ inch up pressure hose was found installed instead of the 12⅞ inch required by the tech order. The "B" nut connecting the hose to the restrictor had loosened allowing the hose to turn and hang. This restricted movement of the gear selection linkage. The continued movement of the handle by the pilot finally freed the linkage allowing the gear to go to the down position. However, hydraulic fluid had been depleted by this time, which necessitated use of the emergency extension system.

Strict compliance with specific instruction in the TO would eliminate this type problem.

FIRE IN COCKPIT

Two T-38s recently had electrical fires in the cockpit because maintenance men installed the ignition control circuit breaker panels (front cockpit) backwards. One of these incidents occurred in flight, the other during engine run-up for takeoff.

It's been a known fact by most T-38 maintenance types for many years that this panel will fit backwards, but if installed backwards the wire bundle will chafe the left throttle cable which could cause an electrical fire.

I know of one outfit that installed a simple little "UP" decal on their panels to help prevent improper installation. Seems like a real good idea.

TIGHTEN NUTS CORRECTLY

During the high speed portion of an A-37 functional check flight, as airspeed passed approximately 350 knots, both indicators fluctuated momentarily and decreased to 30-40 knots. Pitot heat was selected but failed to correct the problem. The pilot declared an emergency and an escort aircraft joined up to assist in a safe landing.

A drain "T" fitting "B" nut had not been properly tightened during prior maintenance. The "B" nut backed off in flight causing system failure.

TECH TOPICS

MAINTENANCE STANDS

Air Force Manual 127-101, paragraph 8-2H(2), requires that all maintenance stands be secured while parked on the flightline, to prevent damage to aircraft or equipment should the stand be subjected to exhaust blast.

One outfit did not comply with this requirement and a B-4 stand was blown into a parked KC-135 during launch of another aircraft. Eighteen manhours were required to repair the aircraft damage.

This same paragraph also requires that the responsible supervisor inspect the various stands daily for condition of the brakes, jacks, securing cables and anchor connections. Are you performing the daily inspections as required by AFM 127-101?

The pilot also has a responsibility for making sure the exhaust area is clear. It doesn't take much wind blast to move one of these stands even when it's properly secured.

REALLY INSPECT

As the C-131 turned final, it was noted that the Nr 2 engine was stabilized at zero thrust, 2000 rpm, and would not react to throttle movement. The approach was continued, an emergency declared and an uneventful landing accomplished.

The flight mechanic, assisted by transient alert, found the throttle linkage disconnected at the carburetor. The nut and cotter key that secure the connection could not be located. Apparently the cotter key had not been installed during previous maintenance, allowing the nut to vibrate off in flight.

Work accomplishment inspections which consist of signing the aircraft form do not prevent accidents (or incidents, in this case). The only thing they do is get the supervisor off the hook (sometimes). They do not fulfill the requirement for an aggressive, searching inspection.

The next time you clear a Red X, get up on the maintenance stand or crawl in that hell hole and take a good look. After you are sure everything is just right, then sign the forms.

OPENER/DISPENSER

Have you taken a good look at that oil opener (spout) lately? It would be a good idea to make sure that the opener is securely mounted to the spout. The openers on some of these spouts are secured with a common 10/24 screw and plain nut.

In one case the nut came off while an aircraft was being serviced with engine oil and the nut almost went into the oil tank. This unit has removed all common nuts and replaced them with self-locking nuts to prevent this hazard. Seems like an outstanding idea.

QUOTE . . .

WITHOUT COMMENT

"While completing a simulated single engine approach, it was noted that the EPR gages in the front seat were connected to the wrong engine."

* * * *

"Evaluation of the UMR indicates that materiel failure of the restrictor valve was not the cause of the reported problem. Difficulty was attributed to the foreign object (thumb tack) in the valve."

* * * *

"EUMR #_____ is downgraded to routine due to the existence of adequate maintenance control."

* * * *

". . . the standby inverter had never been installed and was found sitting on the battery in the nose compartment."

* * * *

". . . disassembly revealed an intermittent breakdown in the primary winding of the rotor and pivot assembly. There were no signs of defects in workmanship. When possible, material defects will be corrected prior to failure. This is closing action . . ."

* * * *

"Unfortunately, the exhibit was inadvertently turned in for overhaul . . ."

WRONG HANDLE

When you reach in the cockpit of any aircraft and start throwing switches and pulling handles, know what you are doing.

One transient maintenance troop apparently was not paying attention. He was installing the drag chute on an F-4 and went to the cockpit, reached in and pulled the canopy jettison handle. One thing that contributed to this incident is that the canopy jettison handle on the F-4 is located in the general area of the drag chute handle on other aircraft.



NOT A TOOL RACK

As the KC-135 started descent, Nr 2 throttle stuck at 88 degrees (cruise power); however, later in the descent the throttle came free and worked normally until landing.

A small metal loop—the kind found on a mechanic's flashlight —was found on the throttle cable in the nose compartment. The loop was marred and scratched where it had interfered with cable movement.

Apparently an unknown individual had found the throttle cable an ideal place to hang his flashlight and he failed to retrieve the metal loop when the job was completed. The control cables in an aircraft are for a specific purpose, and are not designed as a tool rack.

$13,450 STOMACHACHE

Following a completed mission, the F-105 pilot taxied into the chocks and advanced the engine to 75 percent prior to shutdown. At this time the crew chief removed the tank pins from the pin bag and while holding the pin by its streamer end, tossed the pin toward the assistant standing by the right main gear. Yep, the engine ate the pin and got a $13,450 stomachache.

FAULTY GAUGE

During preflight of an F-111 the crew chief noticed that main strut extension appeared to be excessive. Proceeding to check the pressure, he discovered the gage was faulty. The crew chief attempted to locate another gage but was unsuccessful so he continued the preflight, completed the forms and launched the aircraft on schedule.

All was normal on taxi and takeoff roll, but after liftoff the speed brakes failed to retract. (The main forward gear doors also serve as speed brakes on the F-111.) The gear was recycled, but the speed brakes remained extended. The mission was aborted and the aircraft returned to base.

The main struts were found over-serviced which allowed the gear to retract but the linkage to the speed brake control valve would not position to permit the speed brakes to close.

Concerning this incident, a few questions remain unanswered:

- Why was a faulty gage readily available to the crew chief?
- How long had this gage been available for use in this condition?
- Was there actually only one gage available? (The faulty one?)
- Was the supervisor aware of the faulty gage? (He should have been.)
- Why hadn't steps been taken to insure that all required equipment, correctly calibrated, was available to flightline personnel?

TECH TOPICS

THE WRONG WAY

Airman Doe was assigned to inflate the right main tire on a T-38. He took the two-wheeled nitrogen cart (ATC common) and proceeded to the aircraft where he attached the hose to the valve stem, turned the regulator valve full clockwise, and opened the nitrogen bottle.

The wheel assembly immediately split at the attachment bolts. Part of the wheel was blown through the gear door and into the side of the next aircraft, penetrating the skin and cracking the canopy. Some bolts were found 80 yards from the mishap.

The airman had turned the regulator valve to full pressure (estimated 1800 psi) instead of counter-clockwise as required by tech data. Fortunately, this young airman was not injured by the exploding wheel and tire assembly. This incident should remind all maintenance personnel that aircraft tires are deadly weapons when proper safety steps are not followed per the aircraft tech order and AFM 127-101.

CHECK THE BATTERY?

Would you use an open flame to view the fluid level in a battery? Recently a man in another service tried to do just that with catastrophic results. He was detailed to check four 12-volt batteries which were in a poorly lit area under a work bench. The batteries were on a continuous trickle charge because they were used as a source of emergency power. Since he had not brought a flashlight with him, he used his cigarette lighter and, as he bent toward the battery, the resulting explosion blew acid into his face and eyes. The man's injuries may lead to permanent disability.

(CF Directorate of Flight Safety)

FLIGHT CONTROL FOD

During basic flight maneuvers the control stick in both cockpits of the F-4 could not be moved more than one to two inches aft of neutral. The stab aug system was engaged and disengaged with no result. After a controllability check, the aircraft was landed from a long straight-in approach at 220 knots.

Maintenance found part of a 10/32 inch bolt broken off in the rig pin hole in the stabilator bell crank assembly in the left forward missile cavity. The bolt had apparently been used as a rig pin during maintenance and was not removed after being broken. The broken piece of bolt had worked out enough to bind the controls.

Tech Order 1F-4C-2-4, paragraph 2-69 tells how and what precautions to take when using bolts as rig pins.

RIGHT TOOL FOR THE JOB

A CF-101 pilot had to shut down an engine and carry out a single engine approach and landing because of a low oil pressure indication. Investigation revealed that the oil pressure gage was sticking because the instrument casing had been badly dented—apparently through the use of water pump pliers or other similar tool.

It is imperative that maintenance personnel treat aircraft instruments as extremely delicate objects (which they are). In particular, all maintainers must be cognizant of the need to use only the approved tools, in accordance with the applicable tech data, when installing or repairing aircraft instruments.

(Canadian Forces Safety Bulletin)

QC AND THE DASH 6 REQUIREMENTS

Quality Control: Are all Dash 6 requirements being complied with at your base on all aircraft?

Read on: The F-4 was turning out of traffic when the crew heard a loud "bang;" the left generator light came on, RPM went to 55 percent, and oil pressure to 10 psi.

The cause: The throttle control box was found dry of lubricant. This caused the IGV feedback cable to wear and slip, causing compressor stall.

Lubrication of this control box is a 36-month Dash 6 requirement. According to the month and year etched on the box, this one had not been lubricated for **six years.**

Once more: Quality Control, are all Dash 6 requirements being complied with at your base?

NUCLEAR SAFETY AID STATION



IMPROBABLE CAUSE

After a bomb-laden MHU-20C clip-in was loaded in a B-52, two of the bomb racks appeared to be unlocked. The locking cable was stretched over a cotter pin, increasing tension in the cable and partially extracting the rack locks. This resulted in the unlocked condition.

The Dull Sword report gave transport motion during convoy as the probable cause for the cable being in this abnormal position, so one could imagine the effect aircraft motion would have on the system. This was an alarming thought, from a nuclear safety viewpoint! The Dull Sword report was a preliminary/final type, so the information should have been complete and accurate. However, additional investigation revealed that the clip-in had been recertified two weeks before the deficiency was noted, the lock systems operated properly after the cable was released from the cotter pin, and the deficiency was caused by inadvertent placement of the cable by a "person unknown."

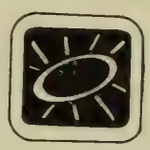
In general, almost everyone is doing a good job of submitting mandatory nuclear safety deficiency reports. Nevertheless, before you submit your reports, check them for completeness and accuracy. If you don't have all the necessary information, submit a preliminary report and follow up with supplements.

TRANSIENT SIGNAL?



NOT ALWAYS!

Intermittent faults in the Minuteman system often result in Dull Swords and the cause is usually diagnosed as a transient signal. Thorough investigation of a recent transient condition proved otherwise. The Execute Launch Command light was caused by a washer embedded between the male connector shell and pin 13 of cable W712. Equipment vibration finally caused the washer to make contact after many months of being undetected. There could be similar cases awaiting detection, so continue to report similar faults. In this case, the crew properly inhibited, as required by AFR 122-30, "Safety Rules for the WS-133A-M and WS-133B (Minuteman II) Weapons Systems."



KUDOS, BUT . . .

Kudos to the alert B-52 flight crew which noticed and reported a nuclear safety deficiency during their aircraft power-off preflight. The release circuits disconnect (RCD) was properly safety wired and sealed, *but the RCD was connected.*

An experienced and fully qualified load crew had just completed an AGM-28B "Hound Dog" Postload Check for Alert, supposedly in accordance with Section VIII of TO 1B-52B-16CL-1. At step 29, they were required to unseal and connect the RCD for several electrical continuity checks. Step 51 calls for RCD disconnect and resealing. The Two-Man Concept applies to this operation and there was a quality control inspector on duty.

It appears that the job had become routine—familiarity breeding complacency. This incident happened on a Friday, probably late in the day. Were they rushing to make a party? Were their thoughts of fun and leisure?

Regardless of the circumstances, we must always be alert in any job involving aircraft or ordnance, particularly nuclear weapons. To paraphrase a familiar saying: ENGAGE BRAIN BEFORE OPENING TECHNICAL ORDER. ★



MAIL CALL

"PILOTS QUIZ"

With reference to the "Pilot's Quiz" (June, page 8), question #9 appears to have no correct answer.

Your situation is as follows: "You are being radar vectored to an ILS approach and the controller tells you 'Cleared ILS approach'." According to your answer, the pilot is then cleared to descend to the intercept altitude.

Not so! What AFM 51-37 really says is that the pilot is cleared to fly the approach *as depicted*. If there is an altitude restriction (based on either DME or on an intersecting radial, for example), the pilot is well advised to adhere to that restriction.

Lt Col Emmett L. Herron
Chief, Flight Stan Div
USAF IFC, Randolph AFB, Texas

You are absolutely correct. Thank you for bringing the error to our attention.—Ed.

"IRAN VERSUS IRAP"

The June issue of Aerospace Safety featured an article "IRAN Versus IRAP." Interestingly a Joint AFSC/AFLC/AMC/NMC Panel on Maintenance Man-Hours Per Flying Hour studied the concept of IRAN (AF) IROAN (Army) and PAR (Navy). The conclusions of the panel were consistent with the article. One of the results of this panel, which bears approval of all the Services, is to consistently redesignate the various acronyms to the Servicewide use of PDM (Programmed Depot Maintenance).

The Army was the first Service to issue their directive as TB55-1500-313-25. The Air Force version will appear in an imminent revision of TO 00-25-4. The Navy is revising OPNAVINST 4790.2.

Robert Chernoff
DCS/Logistics, AFSC
Andrews AFB, Wash DC

"SIX FLAME OUTS LATER"

Your article "Six Flameouts Later" closes with, "You can shorten those odds on your bird by doing the job right the first time." But this excellent article points out not only the importance of doing the job right, but also of doing the right job. Though a crew chief may follow tech data perfectly, if he's not careful he can still be in error, like a surgeon who amputates the wrong foot.

Capt Ralph W. Harker
433 Tac Ftr Sq
APO San Francisco 96304

Your analogy is a little macabre, but your point is well taken.—Ed.

"KEEPING UP WITH THE TIMES"

Many thanks to Mr Taylor for his article, "Keeping Up With the Times," *Aerospace Safety*, May 72. His brief synopsis of the more significant changes to our "Bible," AFM 127-100, is most welcome and informative; however, . . . the third item of the synopsis of Chapter 9 is in error (probably typographical). It states, "(except for HC Smoke, which needs the symbol "B" plus a single diagonal)." The "B" marking is used solely for identification of locations containing Biological Defense Research Agents. . . .

In January, I compiled an alphabetical index to the new manual for use by the additional duty explosives safety personnel assigned to the subordinate units of this Wing. As an afterthought, I submitted it to higher headquarters for evaluation as an item suitable for wider dissemination. AFISC/SEOE has indicated that it will be published as part of Change 1 to the basic. I'm enclosing a copy of that locally produced index. . . . Again, many thanks for a concise, well-written article; one for which I'm sure most of my fellow weapons safety officers are equally grateful. It fills a definite need for a quick reference to the major changes in the manual.

Capt Andrew M. Popovics
Sembach AB, Germany

You're quite right—the sentence should have read "(except for HC smoke, which needs the symbol "D" plus a single diagonal)." We caught the error, but not until it was frozen in print.

Thank you for the compliments. We'll throw one back at you by saying that your index is very well done, very complete, and should be an extremely valuable addition to AFM 127-100. You should be commended for your willingness to contribute to the field of Explosives Safety.—Ed.

☆ U. S. GOVERNMENT PRINTING OFFICE 1972 789-131/12

UNITED STATES AIR FORCE

WELL DONE AWARD

Presented for outstanding airmanship and professional performance during a hazardous situation and for a significant contribution to the United States Air Force Accident Prevention Program.

Captain EDWARD L. CHASE
Major WILLIAM C. BURNS JR.





474th Tactical Fighter Wing, Nellis AFB, Nevada

On 21 January 1972, Captain Chase and Major Burns departed Nellis AFB in an F-111 on a tactical evaluation flight check. The mission was uneventful until, rolling out on downwind, after their last low level bomb delivery, the aircraft suddenly rolled hard to the left. Captain Chase was able to right the aircraft and maintain wings level only by using full right roll control. Numerous warning lights confirmed failure of pitch, roll, and yaw damper systems; CADC, fuel quantity and distribution systems; primary and auxiliary attitude and heading systems; automatic cowl and spike control systems; and pitot and angle of attack heating systems. In addition, most engine instruments and the flight control position indicators were inoperative. His only available instruments were the engine RPM gages, standby airspeed indicator and the altimeter. Captain Chase attempted to reset the damper systems, which caused another violent and uncontrollable left roll. He then turned the dampers off and placed the flight control disconnect switch in OVERRIDE.

An emergency was declared and the flight headed south for recovery at Nellis, with Major Burns helping Captain Chase hold the very heavy right stick pressure required to keep the wings level. A visual check from the chase aircraft did not reveal any external indications of the problems. The aircrew went through all checklist procedures for flight control malfunctions, but none of these procedures relieved the problem. Wing sweep was moved to the forward position. The indicator had failed; however, the wingman confirmed the wings had moved forward. The crew climbed to a safe altitude and accomplished a controllability check. With full flaps, they could not maintain wings level, but Captain Chase determined that he had sufficient control to land the aircraft with 15 percent flaps at 220 KIAS.

Shortly thereafter strong electrical fumes were detected in the cockpit. Major Burns turned off all electrical equipment except the UHF radio, eliminating the fumes. Captain Chase requested a straight-in approach to the inactive runway to avoid flying over a highly populated area. Major Burns insured all landing checklist items were accomplished and pneumatically positioned the cowls and spikes to the proper configuration for landing. A straight-in final was flown at 220 KIAS using full right stick and right rudder, and a smooth touchdown was accomplished in the first 1000 feet of runway. Although nosewheel steering was not available, Captain Chase kept the aircraft in the center of the runway, extended the arresting hook and successfully engaged the arresting barrier at the far end.

Investigation revealed a failure of a hot air duct to the rain removal system. The failure had occurred in the forward equipment bay, and the resulting heat popped 75 circuit breakers, rendering the flight control system completely out of trim and most instruments and aircraft systems inoperable.

The outstanding airmanship of Captain Chase and Major Burns clearly saved one of the most valuable aircraft in the Air Force inventory. WELL DONE! ★



FAITH IN THE FUTURE

SEPTEMBER-OCTOBER 1972

Aerospace SAFETY

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FOR AIRCREWS, MAINTENANCE & SUPPORT TECHNICIANS

SEPTEMBER-OCTOBER 1972

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WELL DONE 29

DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

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SEPTEMBER-OCTOBER 1972 AFRP 127-2 VOLUME 28 NUMBER 9

THE PENNY PINCH

Our regular readers will hav noticed, by the time they g this far, that our four-colo cover is missing. There are oth changes, too, and we may as we point them out here and try to e plain why they were necessary.

Beginning this month, we have c our pages by four. In addition, things stand, we will publish on nine issues during the next months.

The reason for this, quite simpl is budget. We regret the cutback of course. But rest assured that t staff of AEROSPACE SAFET will continue to be as selective a yet diverse as possible in bringi you accident prevention materi

AEROSPACE SAFETY is prou of its 26 year history of combati accidents. We think a part of t credit for our continued improv ment in safety is due to the safe education material presented ov that 26 years. (A recent survey i dicated that 21 percent of the of cers and 17 percent of the airm polled had been helped in an em gency by something they found these pages.)

So we will continue the fight, w every means at our disposal. A we actively solicit your help: yo comments, your ideas, your gripes can be instrumental in helping help the Air Force. ★

Hey, Sam



Hey, Sam, you with the tool box. Could I have about five minutes of your undivided attention? I suppose that if you read this magazine very often you check out the Tech Topics. They're meant primarily for you guys in Maintenance. And you've probably noticed that most of them describe something some maintenance man did that was wrong. Perhaps you also noticed that it's the supervisor who quite often takes the lumps.

Let's forget the supervisor for a minute and get to the real nitty gritty, the guy with the wrench in his hand—YOU! You're the guy who does the work. It's you who torques—or doesn't torque—that fitting. It's you who installs that clamp—correctly or incorrectly. Who makes those hydraulic line connections, or hooks up the wires? YOU! Not your seven- or nine-level boss. And when the work is done, who buttons up the panels? You know.

Now some guys have been known to make a stab at a job, assuming that if there is anything wrong QC or somebody will catch it. But we know from bitter experience that it just doesn't work that way. Sometimes they do and sometimes they don't. Like when the tip tanks on a T-33 fell onto the runway and ruptured. Fortunately, no fire. When they dug into that one, they found that two wires to the left tip were crossed and another wire was connected in error to the tip and bomb release circuit breaker in the aft cockpit. The wire should have been capped and stowed.

The work was done during a TCTO mod and the people performing the operational check didn't follow tech data. Sounds familiar, doesn't it?

Sometimes when the pressure is on things get pretty tight. Ops wants a bird, Job Control puts you on a short schedule, and about that time Supply can't seem to come up with the part you need. But this is a way of life—and not just in the Air Force. Admittedly, at times like this getting the job done right is tough. But it has to be done right. Excuses don't stand up very well when they dig through the wreckage and trace the fault back to you. No matter what the reasons or how many excuses you have.

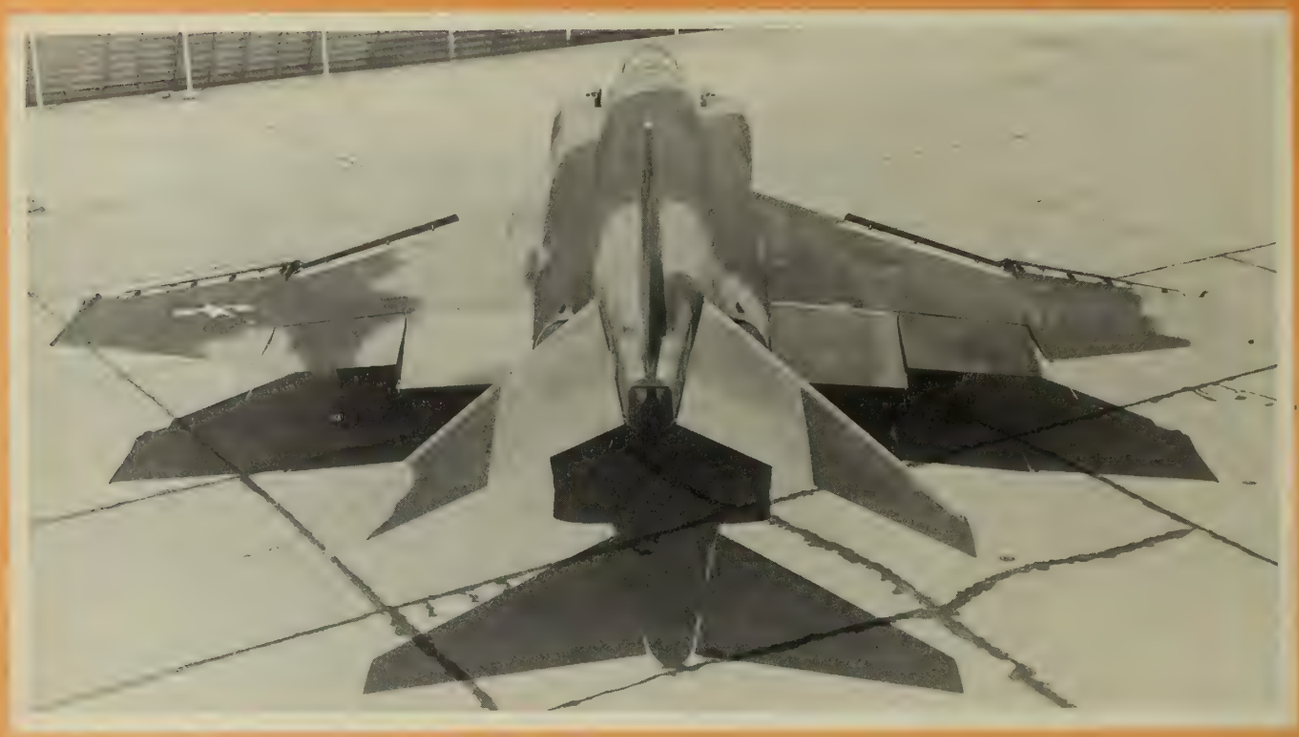
A crew chief found himself in this position when an engine took off in a test cell because the man failed to install the thrust restraining rods that secured the engine to the dolly. There were several things involved. The crew was rushing to meet a deadline. Supply was deficient on part support, which resulted in a backlog of engines, overtime, and a lot of pressure on the engine shop people. Despite all that, if tech data had been used this accident might have been averted.

Speaking of pressure, pilots have their problems, too. Imagine yourself in the cockpit of a single engine fighter. Suddenly you lose AC power because the generator failed, then your secondary hydraulic pressure goes because of metal fatigue of the line to the emergency AC generator. Things get real sticky when you discover that you can't get the nosegear down with the emergency lowering system. So you eventually land on the mains and the nose of the aircraft.

Think of your feelings when it is discovered that the nose gear wouldn't extend because someone tightened the nut on the top drag brace pivot pin beyond clearance limits and the pivot pin and bushings were improperly lubricated.

And so it goes. There are enough of these things in any 30-day period to fill a book. Most of them are picky little things that don't seem too important until one of them costs a life and/or an airplane. Then those seemingly insignificant things like a cotter pin forgotten, safety wire not installed, a couple of lines or wires crossed, torque values exceeded or not achieved, panels not fastened, become very important.

Generally at this point a writer sums up with a sermon or a lecture. But I'm not very good at sermons and lectures. So you can write your own. Have at it. ★



Slats are Better!

IRV BURROWS
Chief, Experimental Test Pilot
McDonnell-Douglas Corp.

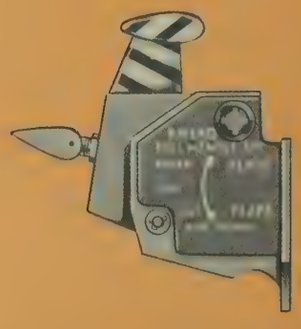
Ready or not, the slats are coming! June delivery F-4Es were slatted—they look and feel different from your average old F-4C through E; and though there ain't nothing in them that'll jump up and bite you, a few words of enlightenment may be in order.

TWO POSITIONS

Let's cover mechanization first. Each wing incorporates two sections of slats—inboard and outboard. Both are hydraulically actuated via the utility hydraulic system. The inboard section moves between the extended (high-lift) position and the retracted (clean) position. The outboard section moves from a high-lift position to a cruise position, which is not retracted but simply rotated (see slats/wing cross-section illustration on page 3).

Both slat sections move in unison, and the total movement is accomplished in about one second. Happily, the movement also takes place very smoothly, relatively quietly, and with almost imperceptible effect on aircraft pitching movement. The net effect is that 90 percent of the time, if you're not watching or listening for them, you won't know when the slats move. Once again for emphasis—they are *two-position* slats—not modulated.

SWITCHOLOGY

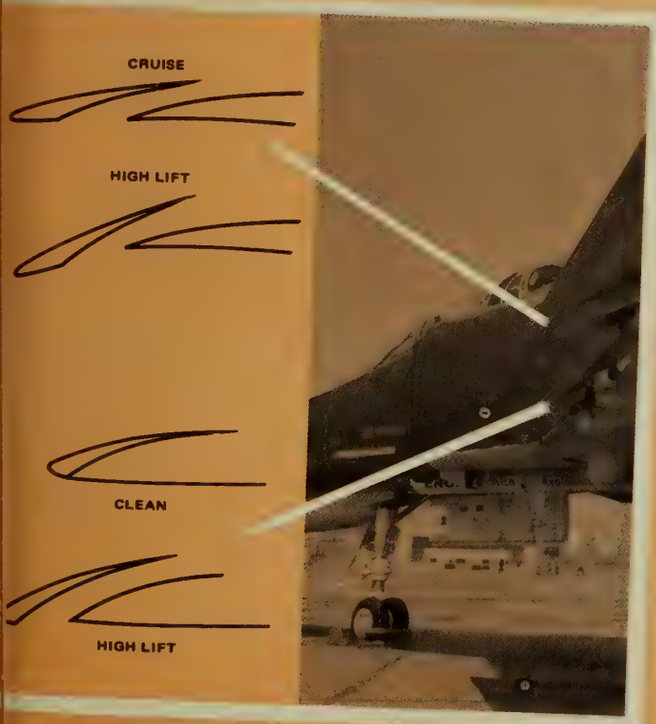


A few items have been changed in the cockpit to accommodate this new "toy." The heart of the slats control is the old FLAPS switch which still has three positions but is relabeled from top to bottom as NORM, OUT, and OUT AND DOWN. NORM applies to almost all flying between the takeoff and landing phases. In this position, you have a slat system which is auto-

matically positioned as a function of angle of attack. No thinking is required—when alpha exceeds 10 units, the slats move out; when it decreases below eight units, they come back in. Two units hysteresis is built in, of course, to keep them from chattering in and out around cruise. Okay? Auto slats in NORM.

The next position down (OUT) gives you a manual slats-out position—anytime this position is selected, those hummers go to high-lift position *unless* one of two conditions prevails: either the OVERRIDE switch is IN, or airspeed is in excess of 600 knots. Any other time, the OUT position should command just that, thereby providing a manual slats mode.

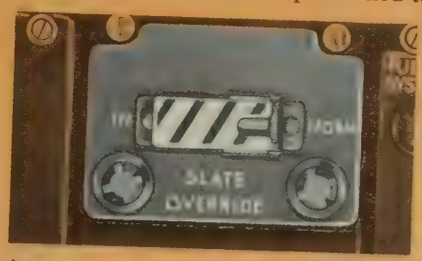
The bottom position (OUT AND DOWN) can be considered normal landing and takeoff selection. You'll get slats and flaps. (Forget about ½ or full flaps—they're now the same; i.e. 30° flaps is the *only* flaps-down position). Now, right here, we felt we saw a Murphy. F-4 drivers the world over have been moving that flap switch one notch down for takeoff. With our original slat mechanism, this position would give you a no-flap, slats-out takeoff—not necessarily a problem, but potentially one if the pilot isn't on his toes (possible overrotation). Our solution here is to interlock the flaps and gear so that if the gear is down (specifically, if the nose gear is down), the OUT position will also run the flaps down. This does not mean that as soon as the gear is retracted after takeoff, the flaps will come up too. The circuitry is designed so that the flap switch must be placed in NORM (or the flap blow-up speed exceeded) before flaps will retract. This eliminates premature flap retractions after a heavy takeoff.



How about a quick review of that: Flaps are lowered whenever OUT or OUT AND DOWN positions are selected with the gear down; with gear up only the OUT AND DOWN notch gives you flaps. Thus, if you've selected OUT with gear up, you'll get no flaps until the gear is lowered—then, down they come. Flaps are raised *only* by placing the switch in NORM.

If I haven't lost you yet, hang in there and I'll try harder.

Earlier I mentioned the SLATS OVERRIDE switch. This is a new addition to the cockpit: a two-position switch guarded to the NORM position with the other selection being IN. If it, in fact, is positioned to NORM,

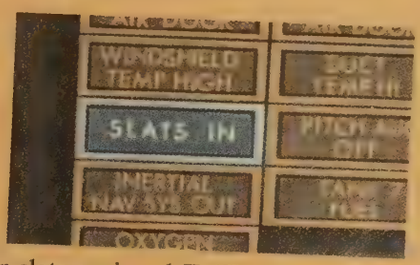


the functions I've ascribed to the FLAP/SLAT switch will prevail. However, if you move it to IN, all other slat selections are overridden, and the slats should come in. The logic here was to provide a capability to retract everything rather than have an asymmetric slat extension due to battle damage or malfunction.

Pneumatic emergency flap extension will give you what you'd normally want under those conditions—flaps and slats—the landing configuration.

So that's it for controls. All the options are available: automatic slats (which I will consider the normal case); plus manual in and out.

NEW INDICATORS



In our slats-equipped F-4Es some new and different indications are presented. The old leading-edge flap

Slats are Better!

CONTINUED

indicator is now a *slat* indicator which moves from IN to barber pole to OUT as the slats move. A new SLATS IN light has been added to the telepanel; it will come on whenever the override IN position is selected. And the old WHEELS light logic has been changed so that it now flashes whenever you're below flap blow-up switch speed (approximately 230 knots) and the gear isn't down.

MORE AURAL TONES

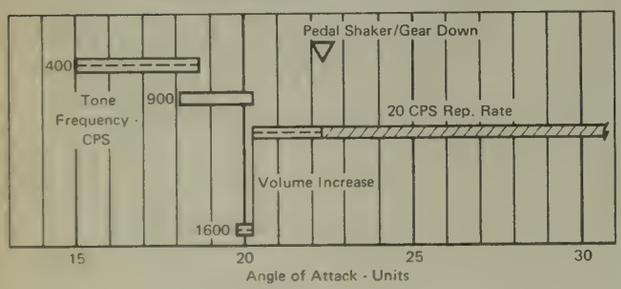
As you'll soon see, the maneuvering handling qualities with slats out are significantly improved. This being the case, it was quite obvious that a change was required in the aural tone pattern. Now we have an airplane which maneuvers at 25 AOA with slats out but which still approaches for landing at 19.2. By the same token, should slats not extend for any reason when scheduled, we're back to a basic F-4 for maneuvering. So what we really need are two tone patterns—one for slats out and one for otherwise. Accordingly, the new schedule (see below) was developed to go along with the old basic schedule, with slats-out logic being obtained from the four limit switches in series. Thus, the familiar old F-4 aural tone pattern will apply anytime one or more slats are still in, *or* for the landing configuration. When slats are out for clean maneuvering, the new tone schedule will be heard.

Your representatives and our guys agreed on the new pattern, feeling that: (a) 23 to 25 was probably going to be the prime maneuvering range; (b) above 25, volume should be at a level that couldn't be turned off; and (c) 29 was a good point for stall warning. Rudder shaker at 22.3 is retained only for the landing configuration—for a 25 unit maneuvering airplane it's obviously undesirable and hence has been deleted.

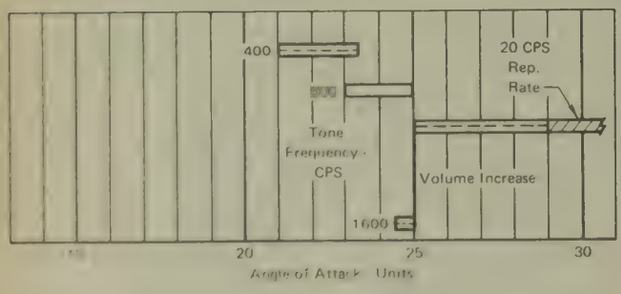
So much for mechanization. The obvious question now is: How does it fly?

AURAL TONES

Slats IN or Slats OUT and Gear DOWN



Slats OUT and Gear UP



UP AND AWAY

Let's go through the normal flight sequence, which, all other things being equal, requires takeoff to occur first.

The airplane is longitudinally more responsive at low speeds—a fact which will be obvious when full aft stick starts the old nose coming up at something less than 100 knots. Takeoff techniques remain the same as in the non-slat aircraft, but you should be prepared to stop the pitch attitude change a little earlier. We've found that the three units nose-down trim previously recommended for the basic F-4E is still okay. Of course, if the slat switch is left up (NORM) for takeoff, it'll be the same as a clean F-4 takeoff. (With weight on the wheels, slats are driven to the cruise position on the ground.) However, as soon as weight is off the wheels, the slats will come out (AOA higher than 10 just after takeoff). This transient is insignificant and won't be a problem.

CHARACTERISTICS

A rundown on handling characteristics will show some which are consistent and repeatable. There are other subtle quirks that, as in all airplanes, will vary from F-4 to F-4, or from pilot to pilot. Generally, this is what happens:

CLEAN—Buffet is less at all angles of attack. I think this will be quite obvious to you the first time you honk it in, particularly at high altitude. Next, I think you'll notice an increase in "comfort" at high alpha—maneuvering from 20 to 25 units is routine. In fact, optimum maneuvering is (at this time) recommended at 23 to 25; and the aural tone will so state.

Aileron effectiveness diminishes above 20, but good roll rates are available with rudder. Above 25, some wing rock will generally start to develop. The exact point it starts, the rate it builds up, the associated yaw, etc., are all variable; and I think it's sufficient to say that anything above 25 units is not considered optimum for maneuvering. The aural volume increase will start here (25); and if perchance you should miss that but begin to feel wing rock and yaw, I would suggest moving the stick forward smartly to decrease alpha below 25. I don't intend to sound an alarm here—we've spent a lot of time above 25 (in fact, above 30). We've encountered some departures (generally between 30 and 35, which we classify as very gentle), but there is absolutely no point in flirting with out of control, and slats, friends, are *not* advertised to prevent out of control. Forestall it, yes; pacify it, yes—but not prevent it. Incidentally, the AOA indicator will still read 0-30, and 30 units will constitute an upper maneuvering placard.

Of course, the obvious capability to pull more Gs (or alpha) for a given airspeed/altitude combination is there. Likewise, specific excess thrust is improved—you can fly formation with a non-slat F-4 in high AOA turns using considerably less power.

One G flight (clean) is also characterized by increased comfort. The airplane can be one G (clean) stalled with only mild buffet and sometimes little or no wing rock. I've seen cases of stick back on the stop, and alpha well above 30 for several seconds, while the airplane simply drops like a rock, but does little else—similar to a delta-wing stall. They're not always this stable, and increasing wing rock from 25 to 30 units is more often the case, but it is significantly more comfortable than the basic F-4.

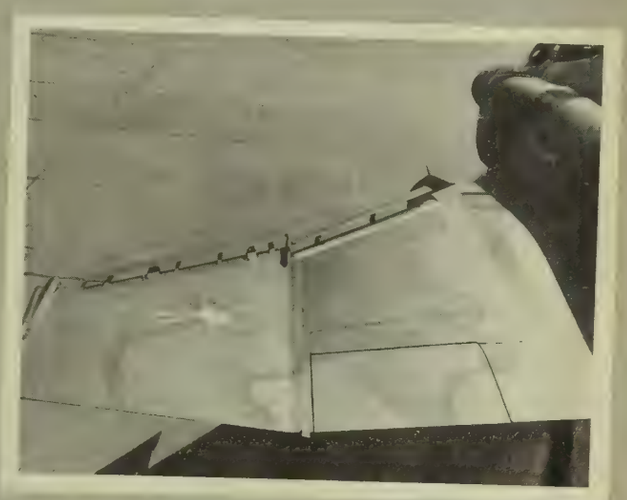
DIRTY—If we have to tone down our bragging a little bit, it's in the landing configuration arena. We've traded a little here to gain a lot of combat capability. Basically, the aircraft approaches about 8 to 10 knots faster than a full-flap no-slats F-4E at the same alpha. While it's doing this, the roll response is just a tad less than you're used to and maybe it's a little tougher to track a constant AOA. On the other hand, there is more stabilator effectiveness, which allows the airplane to be flared a bit before touchdown. Thus some of that extra speed can be bled off and actual ground roll is not excessively lengthened.

A power approach stall is not greatly different from the basic airplane. Buffet is greater, and perhaps so is wing rock (starting at about 25 units). Neither of these detracts from the approach, but they do provide stall warning that is probably more noticeable. There is an area of almost neutral stick force stability (i.e., increased alpha for very slight increased stick) between 23 and 25 units, but we do not feel this is of serious concern since it's very slight and well above normal approach alpha.

THE BEST F-4 YET

So, that's it, guys! As of this writing, the slats program is still underway, and all the returns are not in yet. An upcoming Air Force evaluation, plus some of our own thoughts, may revise a few of the items I've mentioned. For example, the 8 to 10 unit actuation point is up for grabs. It was designed this way based on analysis; it works, but may not be optimum. Other things are under consideration, but won't be determined by the time this article goes to press. Whatever changes may occur from what I've said here should be for the better, and they'll just make it more pleasant for you to fly what we consider to be *the best F-4 yet!* ★

(McDonnell Douglas *Product Support Digest*)



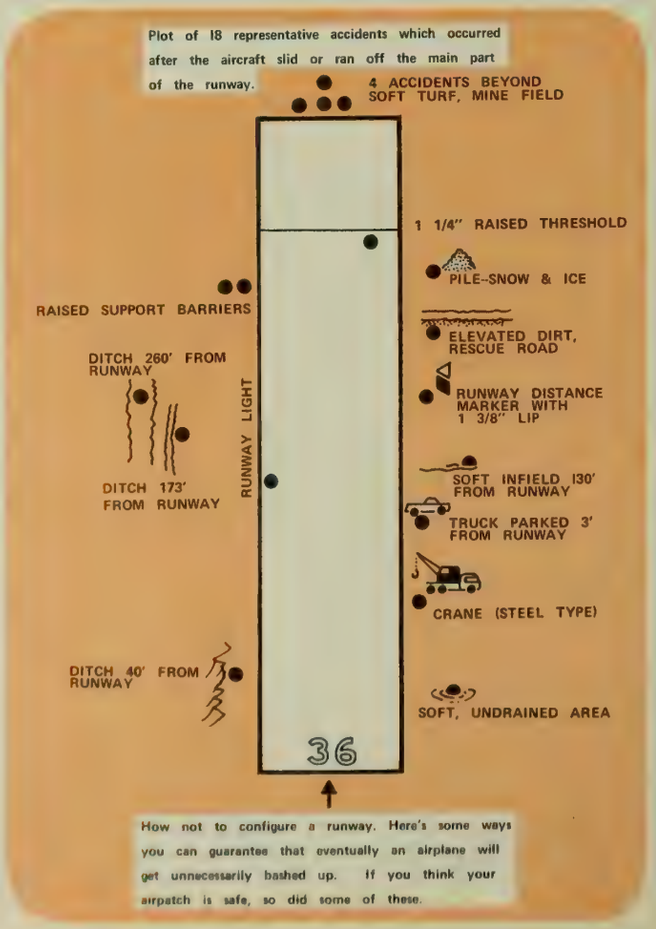
NO DAMAGE UNTIL...

Make a guess. How many times have pilots had a fair chance of getting off more or less unscathed after sliding or running off the runway only to find some kind of obstruction which damaged the airplane? Leaning on the computer for our data, we found that 85 times, from 1968 to date, airplanes suffered damage when they might have gotten away with an incident. We destroyed 27 of these, caused major damage to 29 and minor damage to another 29. We don't mean to say that we would have had 85 undamaged birds out of 85, but we do know a goodly number would have sustained significantly less damage had they not had to run over barrier supports, leap ditches or plow a furrow through soft turf.

A lion's share of these 85 accidents was caused by a ditch near the runway. In fact, ditches, trenches and culverts were the culprits in 25 of the 85 accidents.

Some interesting things came to light looking through the list of events. In one case, a drainage ditch had been dug without the knowledge of the commander, ops or safety officer. It was an unusual set-up, to say the least, but how does a team of engineers with their assorted equipment manage to dig a ditch without knowledge or approval of *somebody?*

An alert ops and safety officer acted in the nick of time to prevent a similar type accident from occurring again within two weeks. They got the clue after the first one and managed to get some corrective action by CE. The initial event occurred when an F-100 got to the extreme side of the runway and hit some runway lights. The lights were constructed so that the mounting base was perpendicular to the runway surface. When the bird ran over it the tire blew and caused the aircraft to swerve into some soft dirt. Result—one minor accident. The simple solution was to flange the mounting base, ramp fashion. Two weeks later another aircraft hit runway light mountings but this time, no blown tire and the pilot managed to get the airplane back toward the center. We can't *prove* that an accident was prevented here but the evidence points that way. In any case, it seems like a sound piece of advice that if you have some runway lights at your base which protrude at a 90 degree angle, why ask for trouble? Smooth 'em out!



Ditches aren't the only way to trap a stray airplane. Here's some other ways you can do it.

- Ditches, trenches, culverts—25
- Unprepared runway shoulders/overrun—15
- Barrier stanchions, BAK-12 type housings—9
- Runway/overrun lights, poles/supports or markers—9
- Vehicles or buildings—7
- Construction areas—7
- Plowing into road (from soft surface)—5
- Snowbanks—4
- Lakes, creeks, marshes—3
- Other hazards—1

Many of our problems arise from abuse of the waiver route. A base will be granted a legitimate waiver. After a while, whenever anyone asks about an airfield hazard, the canned answer is "Oh, that's on a waiver." One base managed to parlay this condition for six years—until it contributed to a major accident. The hazard became such an accepted thing after a few years that nobody exerted pressure to get it fixed. (Do you have any of these old waivers lying around your base?)

Something is being done to remedy the waiver problem. AFM 55-48 tells ops, the safety guy and CE that they *have* to get together at least once a year and review all these hazardous things we sidestep and see what is being done to fix them.

Of course, nothing will get done if you don't know a hazard exists. Have you ever seen a hazard and wondered if somebody with a little authority was aware of it? Did you continue to wonder until somebody got hurt or did you bring it to the attention of ops or safety? We insist that these individuals who can do something know all; but it's possible to overlook a hazard now and then, so give them a hand. Once you have identified a hazard and find that nothing can be done about it until tomorrow morning, make sure that everybody who may have an occasion to use the airpatch *knows* about it. Brief it, NOTAM it and put it in the Enroute Supplement—but don't ignore it!! ★

big wind

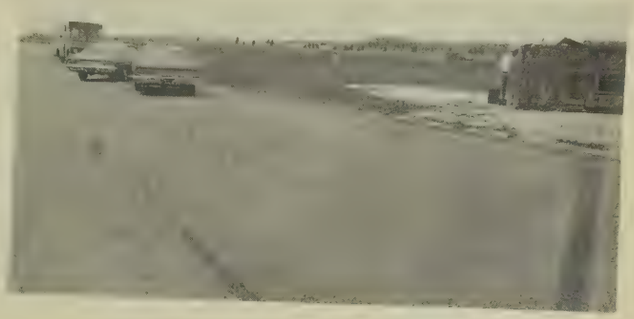
Two recent mishaps stress the need for care and planning when a C-5 is on the airpatch. In one case a VASI light box was blown off its mounting and destroyed. The VASI was 400 feet behind the aircraft.

The other case involved a step van and driver. The blast from the engines of the C-5 blew the van onto its side and off the taxiway. Distance from the engines to the van was measured at 312 feet.

In both cases circumstances contributed to the accidents. In the first, the primary C-5 runup pad was occupied, so clearance was received for a maintenance engine run on another pad. The van driver was at fault in the other accident because he was driving in a prohibited area. Contributing circumstances guaranteed trouble. The aircraft was parked adjacent to another C-5 which screened the van from the ground scanner until too late for him to have engine power retarded in time. Coincidentally, another C-5 was blocking out and the van driver assumed the noise was coming from that aircraft. Finally, all four engines had been modified to a smokeless configuration so the normal smoke was not present.

P.S. The van driver was not injured; he was wearing his seat belt! ★





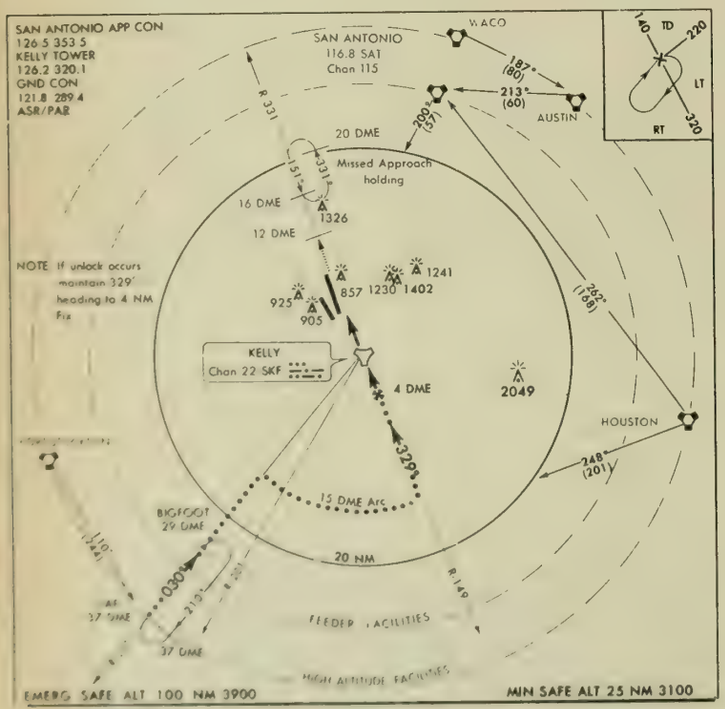
THE IFC APPROACH

By the USAF INSTRUMENT FLIGHT CENTER
Randolph AFB, Texas, 78148

REVIEWING AN INSTRUMENT APPROACH PROCEDURE

The IFC receives many questions related directly to the interpretation of instrument approach procedures. In order to clarify some points, this article is directed toward a simple systematic plan to review an approach. Hopefully, your knowledge of the symbols shown in the approach procedure legend and thorough analysis will contribute to a safely executed approach in every case. Major Gary Crew, an instructor in the IFC, offers a plan to those attending his IRC class. He recommends the following:

1. PLAN VIEW—Review for LEAD POINTS:



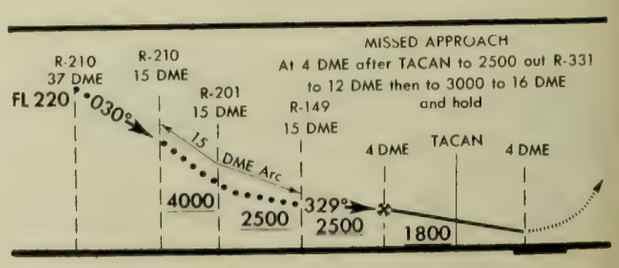
Mentally fly the approach from the IAF to the MAP and determine all lead points for radial and/or arc interceptions. Identify the point where the aircraft should be configured for landing. In the example above, note the 15 DME arc interception followed by the 149 degree radial. The landing configuration must be established prior to 4 DME (FAF). Procedural steps and techniques for arc and radial interceptions are found in AFM 51-37, *Instrument Flying*.

While reviewing the Plan View, you will undoubtedly notice headings, nav aid frequency and location, and the holding pattern. Other information available to you and often questioned warrants further discussion:

FEEDER ROUTES are designed to channel aircraft from the enroute structure to the *IAF*. They are published only if they provide an operational advantage and coincide with the normal local air traffic flow. The feeder route length may exceed the operational service volume area of the navigational aids if the FAA has flight checked the route for accuracy. What you see published guarantees nav aid reception along the depicted route.

MINIMUM SAFE ALTITUDES provide the pilot *at least* 1000 feet of obstacle clearance within a specified distance from the navigational facility upon which the procedure is predicated. An emergency safe altitude provides a 1000 foot obstacle clearance within 100-mile radius of the nav facility, or 2000 foot obstacle clearance where the radius encompasses designated mountainous areas. A minimum sector altitude is used to offer relief from obstacles within specific sectors of the minimum safe area as determined by the operational needs of the aerodrome.

2. PROFILE VIEW—Review for ALTITUDES AND DESCENTS:

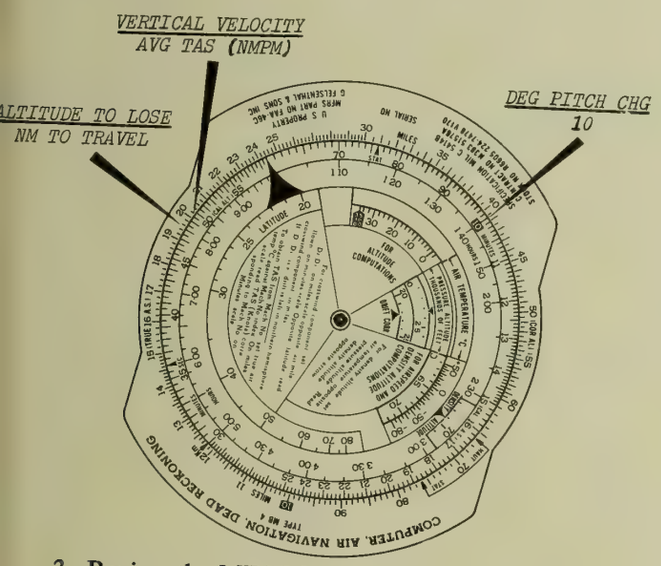


Observe the altitude restrictions and know where they apply. Minimum, maximum, mandatory, and recommended altitudes PRECEDE the fix or facility to which they are intended. If this is not the case, an arrow will indicate exactly where the altitude applies.

Determine your rate of descent and pitch attitude necessary to attain the descent gradient. In the above example, note that up to 19,500 feet can be lost in 48 NM (FL 220 at IAF 37 DME to 2500 feet at FAF 4 DME). Your computer can be used to figure an approximate descent gradient for any aircraft at any airspeed as follows:

$$\frac{\text{Altitude to Lose}}{\text{NM to Travel}} = \frac{\text{Vertical Velocity}}{\text{Average TAS (NM per minute)}} = \frac{\text{Degrees Pitch Change}}{10}$$

For example, if the average TAS is 5 NM/Min, a 4° pitch change will produce a VVI indication of slightly over 2000 feet per minute. This computation may determine your descent configuration and save fuel at the same time.

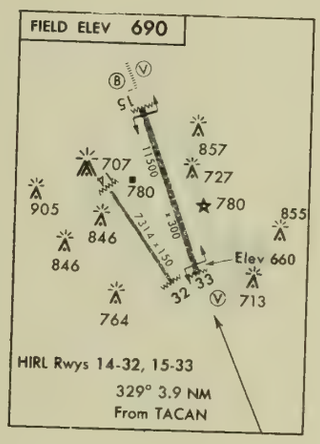


3. Review the MINIMA:

CATEGORY	C	D	E
S-TAC-33	1060/50 400 (400-1)		
CIRCLING	1200-1½ 510 (600-1½)	1240-2 550 (600-2)	
S-PAR-33	960/40 300 (300-¾) GS 2.5°		

The pilot obviously needs to know how low he can descend, and must determine the field weather conditions in order to comply with AFM 60-16, *General Flight Rules*. Minimums for your aircraft category should be firmly in mind.

4. Review the Aerodrome Sketch for AIRFIELD AND LIGHTING:



Check the field elevation, which incidentally is the highest point on the usable landing area. Additionally, note the direction and distance of the runways from the nav facility. In your search for visual cues available in the example, note that high intensity runway lighting is available; however, there are no approach lights for Runway 33. VASI is available to assist you during your visual approach.

As a final word of caution, review carefully for notes on the approach procedure. Notes are used to identify either non-standard terminal instrument approach criteria or emphasize areas essential for the safe accomplishment of the approach. For example, refer to the Plan View in paragraph 1.

The bulk of our telephone inquiries plus indications from our students at IPIS concern one thing: TEACH ME TERPS! (AFM 55-9) Remember that TERPs is a technical manual to assist approach designers. The KEY to a pilot understanding the approach is not his knowledge of TERPs, but his ability to quickly and efficiently analyze the approach. Hopefully, the above technique will assist you in developing your own *systematic* approach to the instrument procedure; a piece-by-piece review provided leads, vertical velocities, pitch changes, nav facility locations, etc. Follow this technique if you desire, or develop your own system. ★

A-7

APN-190 ANTENNA and RADOME HANDLING

P. E. MILLER
Lead Avionics Quality Engineer
Vought Aeronautics

The APN-190 is a solid state radar set which uses the "Doppler" principal for continuous measurement of ground speed and drift angle. The APN-190 consists of three Line Replaceable Units; a Control Indicator, Receiver-Transmitter, and Antenna. The receiver-transmitter transmits RF energy through antenna to the ground and measures the shift in frequency (the doppler shift) of the reflected energy returned to the antenna. Using this frequency shift, the logic in the receiver-transmitter computes aircraft ground speed. Through the use of a special beam configuration, aircraft drift angle is also computed. Both ground speed and drift angle are displayed on the control indicator. The APN-190 is contained entirely in the aircraft and is independent of ground-based aids.

Because of the precise construction of the antenna and the radome, it is extremely important that they be handled properly. This article will discuss recommended handling and care of the Doppler antenna and radome.

Due to the high degree of ground speed and drift angle accuracy required by the A-7 Navigation and Weapons Release system, it is necessary to consider the small physical differences (surface finish, slotted hole size and shape, etc.) of each antenna array (see Figure 1). Physical differences between antenna arrays, if not compensated for, can cause ground speed and drift angle errors; therefore, all antennas are flight calibrated by the supplier prior to shipment to VAC. From these calibration flights, an antenna calibration constant is determined for each antenna. The calibration constant value is indicated on the antenna; and the ground speed calibration (Vg Cal) circuitry on the antenna is programmed to reflect this value. Based on the value of this constant, the Vg Cal signal is sent to the digital card in the receiver-transmitter to correct the doppler ground speed output to the Navigation Weapons Delivery Computer and to the Control Indicator. Drift corrections are made by a bias adjustment on the antenna. The value of this calibration constant cannot be determined on the ground; thus, any physical change to the antenna arrays and associated waveguides will cause errors. Because of the criticality of this constant, it is extremely important that the arrays do not come into contact with hard surfaces that may damage their finish, change their slotted hole shapes and sizes, or cause other physical change. Each spare antenna is shipped to the field on a special wooden mount to protect the antenna array from damage. Vought Aircraft Quality Engineering recommends that any time an antenna is not in an aircraft or being tested, it should be stored on that mount. When removing or replacing an antenna on an aircraft, care should be exercised to assure that the arrays do not come in contact with the ground or other hard surfaces. Under no circumstances should an antenna be placed on a ramp or hangar floor. Remember that if any physical damage occurs to the arrays, the antenna calibration constant may be degraded to such a degree that navigation accuracy will be unacceptable. The only way a more accurate calibration constant can be determined is to return the antenna to the supplier for range tests and a calibration flight.

As previously mentioned, the RF energy is transmitted by the receiver-transmitter through the antenna to the ground and the reflected energy is received by the antenna and sent to the receiver-transmitter for processing. The antenna is protected from weather and other elements by a radome. The APN-190 radome is carefully constructed to allow the

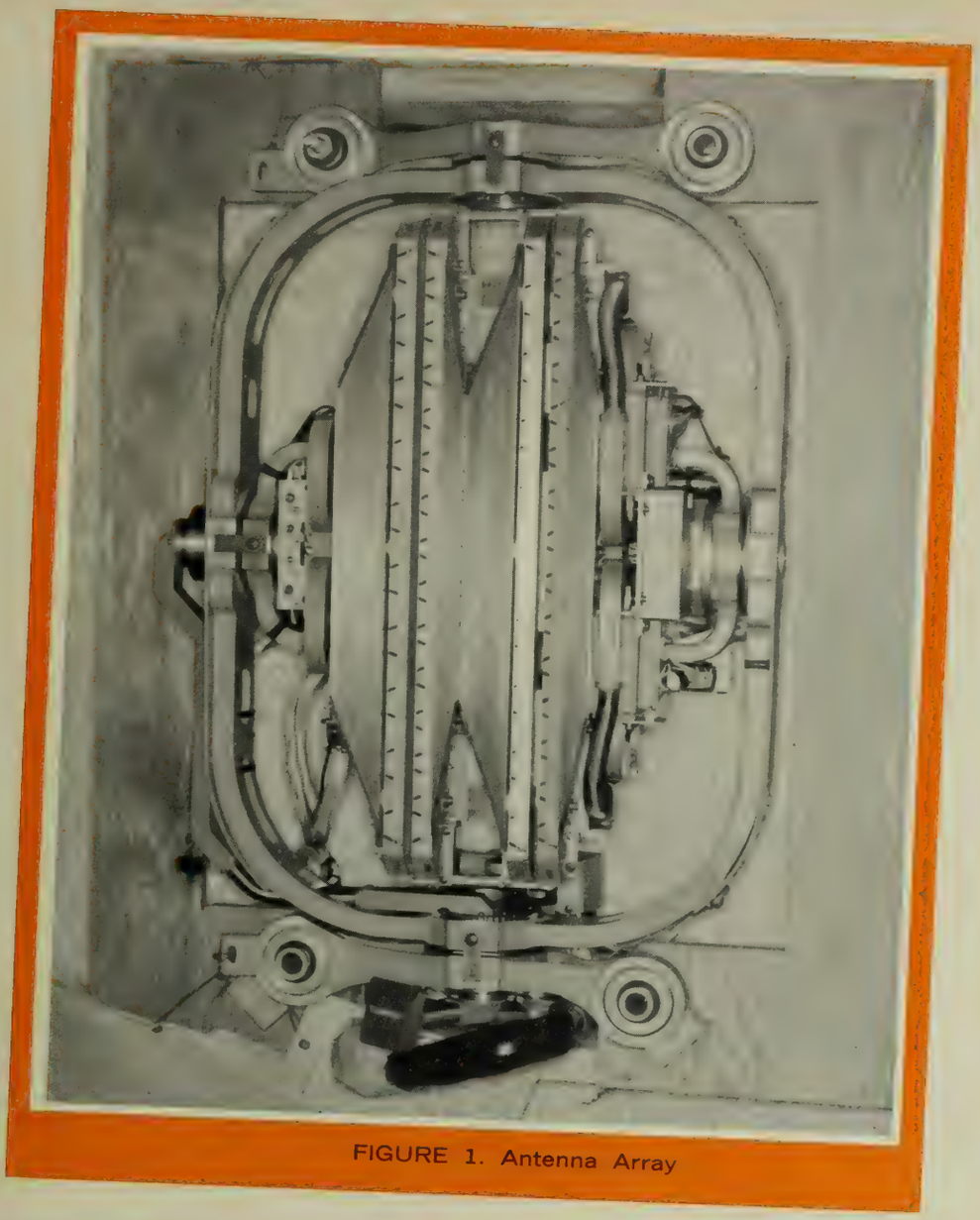


FIGURE 1. Antenna Array

narrow beams of RF energy to be transmitted to the ground with a minimum amount of distortion. Any distortion of this energy severely affects doppler accuracy. It is extremely important that both the exterior and the interior of the radome be free of grease, grime, hydraulic fluid, and compounds containing metals which will distort the transmitted and received RF energy. In addition, care must be exercised to assure that screws and other metal objects are not left in the radome when it is installed. VAC Quality Engineering recommends that before each flight, the exterior of the radome be checked for cleanliness. If it is excessively dirty, it should be cleaned with a mild detergent (soap and water). Also, whenever a radome is removed, its interior and the antenna compartment should be checked to assure that they are free of dirt, grime, hydraulic fluid and metal filings before re-installing the radome. Since the radome material is highly absorbent, it is protected by a special paint which prevents hydraulic fluid and grease from being absorbed by this material. If this paint is excessively chipped or scratched (as determined by TO 1A-7D-3) the radome should be removed and refinished. Therefore, the exterior of the radome must not come in contact with the ground or other hard surfaces which may cause scratches or chips.

Remember, protect the antenna arrays from damage and keep the radome clean and free of chips and scratches. If these practices are followed, the APN-190 should maintain a high degree of system accuracy. ★

(VAC Field Service ***Maintenance Digest***)

HANGAR FLYING ?

The script (incident report) read something like one of those oldtime comedies they run on the late, late TV shows. The pictures on this page show the results; now let's fill in the details.

The F-100 was in for an engine run. However, one of the day shift mechanics thought they were preparing the bird for engine removal so he disconnected the throttle. When the swing shift came on, they finished removing the tail section and prepared for the engine run. The bird was put in the hangar and the tiedown bridles connected by an experienced mechanic and a new guy, each taking one. Then the experienced man inspected the other man's work but did not detect slack in the bridle cables.

Everyone went to dinner.

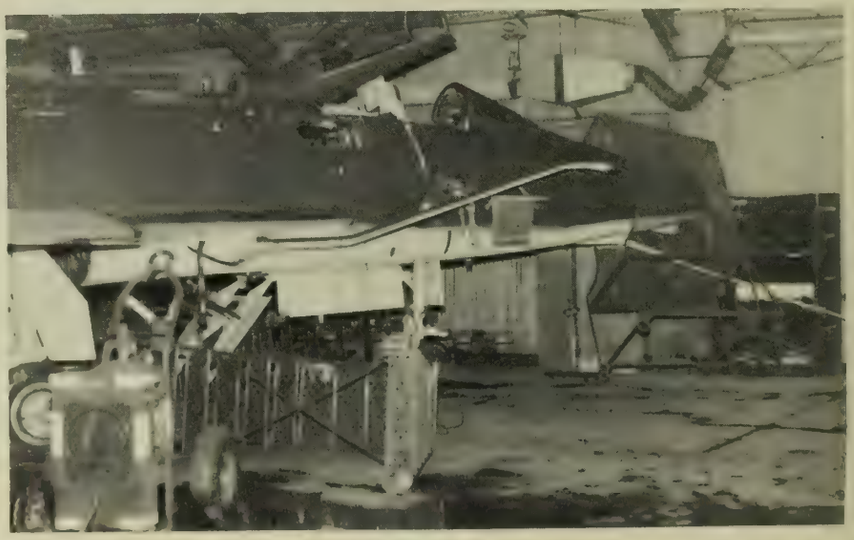
Upon their return the engine run mechanic and two technicians prepared for the engine run. Now trouble was guaranteed. The engine run mech pulled a cockpit inspection but he failed to accomplish a full engine pre-start check, and he did not make any false starts as specified in the directives. Furthermore, the chocks in front of the mains were allowed to remain loose to allow for tightening of the bridle cables during engine run.

Now, without the disconnected throttle being detected, the engine was started. Acceleration to idle was normal, but continued up to about 87 percent. At 70 percent the mechanic put the throttle to off, which helped not a whit. He then closed the main fuel shutoff valve but the engine was slow in getting the message.

Next, the right bridle cable came loose from the attaching ring and the aircraft pivoted left and into the wall. It must have been a sight—the pitot boom struck through the wall like a giant mosquito's stinger, sparks flying from the tail pipe from various objects being ingested by the engine, maintenance stands flying. The exhaust blast turned over a power unit, and its fuel tank ruptured. It caught fire from the engine exhaust.

Luckily—and it must have been pure luck—no one was injured, but when the damage was added up, the tab came to $32,444.

Presumably this crew will never again take anything for granted. ★





REX RILEY'S CROSS COUNTRY NOTES

876-2633 AUTOVON

The Budget Pinch has found its way into the transient pocket and as a result we see more and more notes in the Enroute Supplement saying "Extremely limited transient service." It's a fact of life that something must give and the only one that can decide where the cut is to come is the individual who runs the mission. However, on the other side of the coin there are many bases that are somehow managing to maintain the high standards required to remain on or qualify for the Rex list. So what I'm saying is that we cannot lower our standards while some bases are able to provide sustained outstanding service. If a base is selected for the Rex award, a pilot transiting that base should expect nothing but the best. If your base is now on the list and you have to eliminate some of the desirable services, it may be that you will have to be removed from the recommended list.

Feedback: It always is nice to hear from you guys in the field if only to reassure us that you read my column. A few months ago I mentioned a problem concerning the servicing of recips with oil. The reg does not authorize a base an oil truck unless it pumps a specific amount each month. Most of the complaints indicated that it was very time-consuming to pour the oil in the engine a quart at a time. In case you are not aware, oil is available in five-gallon cans, so I am informed by one transient troop. It seems to me that the best "fix" would be a 55-gallon drum with a simple handcrank on it. Does anybody have one of these?

It Is Gratifying that so many of the bases have written me saying they feel they are ready and willing for an evaluation for the Rex award. Many of you have sent loads of evaluations to us here, all extolling the virtues of this or that transient organization. Unfortunately, immediate response to your request is in most cases impossible. There just aren't that many airplanes available to do the job. So, bear with me. As soon as we possibly can we'll arrange a special visit. No, I'm afraid I can't give you any prior notice, though I'm sure it wouldn't spur you to provide something extra. Incidentally, in case you haven't noticed, we place much more weight on the evaluation of a captain or lieutenant than we do a code seven or above. The reason should be obvious. If I do get a poor evaluation from a code, I can just imagine what kind of treatment a new slick wing lieutenant will get. ★



REX RILEY

Transient Services Award

LORING AFB	Limestone, Me.
McCLELLAN AFB	Sacramento, Calif.
MAXWELL AFB	Montgomery, Ala.
HAMILTON AFB	Ignacio, Calif.
SCOTT AFB	Belleville, Ill.
RAMEY AFB	Puerto Rico
McCHORD AFB	Tacoma, Wash.
MYRTLE BEACH AFB	Myrtle Beach, S.C.
EGLIN AFB	Valparaiso, Fla.
FORBES AFB	Topeka, Kans.
MATHER AFB	Sacramento, Calif.
LAJES FIELD	Azores
SHEPPARD AFB	Wichita Falls, Tex.
MARCH AFB	Riverside, Calif.
GRISSOM AFB	Peru, Ind.
CANNON AFB	Clovis, N.M.
LUKE AFB	Phoenix, Ariz.
RANDOLPH AFB	San Antonio, Tex.
ROBINS AFB	Warner Robins, Ga.
TINKER AFB	Oklahoma City, Okla.
HILL AFB	Ogden, Utah
YOKOTA AB	Japan
SEYMOUR JOHNSON AFB	Goldsboro, N.C.
ENGLAND AFB	Alexandria, La.
KADENA AB	Okinawa
ELMENDORF AFB	Alaska
PETERSON FIELD	Colorado Springs, Col
RAMSTEIN AB	Germany
SHAW AFB	Sumter, S.C.
LITTLE ROCK AFB	Jacksonville, Ark.
TORREJON AB	Spain
TYNDALL AFB	Panama City, Fla.
OFFUTT AFB	Omaha, Nebr.
McCONNELL AFB	Wichita, Kans.
NORTON AFB	San Bernardino, Calif.
BARKSDALE AFB	Shreveport, La.
KIRTLAND AFB	Albuquerque, N.M.
BUCKLEY ANG BASE	Aurora, Colo.
RICHARDS-GEBAUR AFB	Grandview, Mo.
RAF MILDENHALL	U.K.

A CLASSIC CASE

IX. FLIGHT SURGEON'S COMMENTS, ANALYSIS AND RECOMMENDATIONS

The aircraft was a single ship xxxx which departed xxxx hours on a rotational cross-country flight. Approximately 45 minutes into the flight, the pilot noticed that the cabin altitude was 24.5M. Both crewmembers went to 100% O_2 while the pilot attempted to regain pressure; however, the navigator had, throughout the flight, been flying with a loose face mask because it did not fit comfortably on his face. While attempting to regain pressurization, the pilot and navigator discussed what measures should be taken if pressurization could not be regained.

They concluded that they would continue at altitude on 100% O_2 and discuss any symptoms which might arise; if one developed symptoms of pain in the joints or back they "would not move or rub the affected part."

The decision to remain at altitude was based on the fuel status of the aircraft. Although they felt that they probably could reach base if they flew at a lower altitude, they would arrive with very little fuel left. The pilot attempted to increase cabin pressurization by increasing the heat and antifog, but the navigator could not tolerate this, and they had to return to a setting which yielded 23.5M cabin altitude. At this point the navigator noted both arms becoming numb, and he had tingling in his hands. He removed one glove and saw a bluish color of the skin. He then told the pilot that he was hypoxic. During this time he also noted greying of vision, dizziness, and extreme anxiety. The pilot began a spiraling descent and the navigator became very disoriented and was "babbling." At the time he declared hypoxia, he went to emergency oxygen. After reaching 10M, all of his symptoms resolved except for anxiety, nausea, and some tingling of his fingers. At 10M the pressurization system suddenly functioned, and again because of the fuel status, they began a cautious ascent. Cabin pressurization held at 10M all the way back up to the assigned flight level, and the remaining 40 minutes of flight were uneventful. About 10 minutes from base, the pilot declared an emergency and the aircraft was met by the usual crash/rescue group. One of the crewmembers later

How many of you take your O_2 system for granted? Here's a true story that illustrates what can happen if you do.

commented that "if he had known how much trouble this would cause we wouldn't have told anyone."

In addition to an analysis of the crewmembers blood, an (gaseous) oxygen sample was obtained from the cockpit and sent to McClellan for analysis. The results indicated contamination with atmospheric gases during the sampling. The rear seat oxygen regulator was checked and found to work properly and mask and connector were tested in the altitude chamber with normal results.

COMMENTS: It is believed that this represents a true case of hypoxia caused by several factors. After the aircraft was impounded, a malfunctioning front canopy seal mechanism was identified, so that the loss of pressurization was explained. The combination of a poorly fitting face mask, loosely worn, and the insidious loss of pressurization during the flight produced the incident. Several points emerged here which are important and should receive wide dissemination in flying safety meetings.

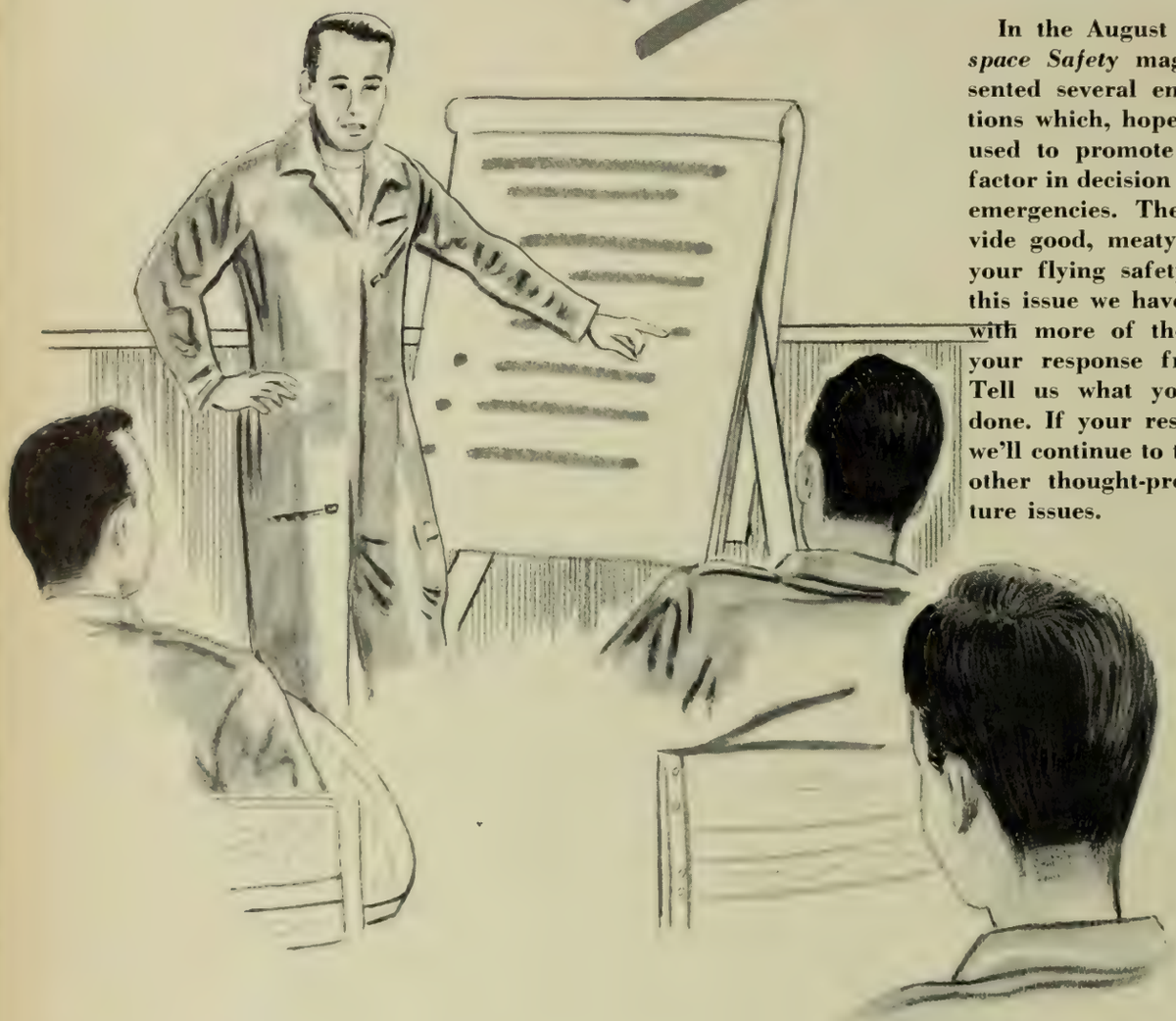
The first is the requirement that the flyer himself tell someone if personal equipment does not fit properly. Neither the Flight Surgeon nor the Personal Equipment Officer were aware of any such problem.

A second point is the misapprehension about the significance of bends. It will be obvious that the primary concern of bends is not just painful joints. Additionally important is the "let's don't cause trouble" attitude regarding incidents of this nature. After lengthy explanation with illustrations of what could have happened, both crewmembers now understand why reporting of this incident was important. Finally there is a very important problem with attitude about personal equipment. In essence, it can be described as "being spoiled by the reliability of life support systems." It applies not only to reliance upon cabin pressurization systems, but also upon masks performing properly and ejection mechanisms functioning perfectly. Confidence in the systems is certainly desirable, but the blithe assumption that "this will be just another routine flight" can kill.

MORE EMERGENCY

CAPT KERRY G. HERRON
Directorate of Aerospace Safety

In the August issue of *Aerospace Safety* magazine we presented several emergency situations which, hopefully, could be used to promote the judgment factor in decision making during emergencies. They should provide good, meaty discussions at your flying safety meetings. In this issue we have provided you with more of these and solicit your response from the field. Tell us what you would have done. If your response is good, we'll continue to try and publish other thought-provokers in future issues.



C-130



SITUATION: You are the aircraft commander of a C-130E, cruising at FL220, midway on a flight from CCK to DaNang. You have six passengers and four pallets of cargo. The ramp pallet is hydraulic fluid, and the other three are building materials. The weather is layered cirrus from 5000 to 30,000 feet.

EMERGENCY: The loadmaster reports black smoke in the aft cargo section, and after investigation, reports to you that the packing material of the pallet next to the ramp pallet is smoldering, emitting dense acrid smoke and a few open flames. His attempts to extinguish the fire with a portable extinguisher have had no apparent effect.

ANALYSIS:

1. What are the critical action items to be accomplished?

2. Would you concentrate on at-

SITUATION TRAINING

tempting to extinguish the fire, or would you jettison the cargo?

3. If you decide to descend, describe the descent profile.

4. If you attempt jettisoning:

a. At what altitude?

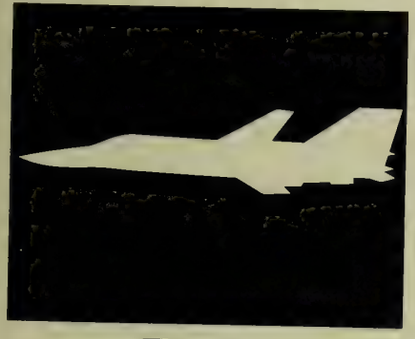
b. Discuss passenger considerations.

c. What sequence of jettisoning would be used?

d. Describe the aircraft configuration.

e. What are the smoke and fume elimination procedures?

f. If cargo was jettisoned, what actions should follow the jettisoning?



F-111

SITUATION: You are the aircraft commander for an F-111 night low level TFR training mission which departed Nellis AFB at 2000 local. You have just begun the low level portion of the leg, 150 miles north of Nellis. Your TAS is 480K, altitude 1000 feet AGL, and you are on auto TF and roll autopilot. Your left utility hydraulic warning light illuminates; you check the utility hydraulic pressure gage and it reads 2300 psi. You abort the run and initiate a climb for RTB. Then the right utility hydraulic, pitch, roll and yaw damper warning lights illuminate, and system pressure drops to zero and shows no sign of recovery.

A weather check of Nellis determines that the current observation and one hour forecast is intermittently 500 feet overcast, two miles visibility with heavy rain from a series of thunderstorms. Winds are reported at 270°/20G30K. The nearest suitable alternate is Mt Home AFB with 1200 broken, 4000 overcast, five miles, wind calm. Your fuel state is 23,000 pounds.

ANALYSIS:

1. What has occurred?

2. Which system will be completetly inoperable?

3. Would you attempt to reset the dampers?

4. Discuss systems requiring alternate power sources, and the source for each system.

5. Where would you recover?

6. Would you dump fuel, and if so, down to what state?

7. What type of approach would you request?

8. Discuss the order of landing configuration changes.

9. Discuss position, airspeed, and method of lowering slats and flaps.

10. Discuss position, airspeed and method of gear extension.

11. What would you do if the landing gear warning lamp remained lighted after gear extension?

12. If the slats and flaps did not extend when selected, what should be checked before attempting a no-flap landing?

13. Discuss directional control and braking technique during landing roll.

14. If brake pressure is lost, what would you do?

15. If recovering at Nellis, would you make an approach end barrier engagement?



T-33

SITUATION: You have departed K. I. Sawyer AFB for a target trip to North Bay, Canada (225 miles). Departure weather at Sawyer was 400 overcast, visibility one mile in light snow showers, with tops reported at FL250. The three-hour forecast indicates no change.

EMERGENCY: At 5000 feet on the climbout, the generator out warning light illuminates and the loadmeter reads zero.

ANALYSIS:

1. What important steps should be among your first reactions?

2. How much battery life could you expect to have?

3. What equipment would you turn off?

4. What equipment would be lost with the standby inverter selected?

5. How much fuel would be available to you?

6. Would you attempt a landing at Sawyer? If so, what type of approach? Would you jettison the tips?

7. If the closest usable alternate was Duluth AFB (200 miles) with 1500 broken and three miles, would you go there?

8. If the closest usable alternate was Kinchloe AFB (120 miles) with 1500 broken and three miles, would you go there?

9. If your battery failed during the landing approach before you had the runway in sight, what would you do? ★

Ops topics

UNSAFE GEAR

The crew of the transport had started the enroute descent after an 18-hour flight. Passing FL380, the gear was lowered; both mains indicated down and locked, but the nosegear showed intermediate, the light in the gear handle was illuminated and the warning horn was blowing.

All associated circuit breakers checked okay, and, continuing descent, the crew decided to recycle the gear. The gear came up and locked all right, but when it was lowered again, the problem was still there.

They tried to get a visual check on the gear, *but the alignment stripes were so badly deteriorated that they were unusable*. The crew went through the emergency landing gear extension procedures—no help. They tried positive G—with negative results. Hydraulic assist was applied—but that didn't work either.

Descent was continued to 10,000 feet. Radio contact was made with hydraulic specialists at the arrival base, and they recommended that the nose gear inspection window be removed and the nose gear locking pin be inserted. Frustration mounted as the crew discovered that the screws securing the window, because of their offset location, could not be removed with an ordinary Phillips-head screwdriver. Finally, they taped the inspection window and broke the glass with a crash axe. The pin then had to be inserted by feel and that took almost an hour. Once the pin was in place, the lanyard was secured. An uneventful landing followed—19 hours and 45 minutes after takeoff.

The cause? A wire in the cannon plug to the nose gear position switch had shorted, giving the unsafe indication. The gear was down and locked all the time!

The unit recommends the following actions:

- Assure that alignment stripes on all aircraft are in good repair.
- Place a textured finish around the hole for the gear pin.
- Include a tool kit aboard the aircraft with the tool(s) necessary to get the inspection window out.
- Consider modification of windows to incorporate wing nuts instead of screws.

A TIME FOR EVERYTHING

The polls are closed, the votes are counted, and once again the results are conclusive: Squat switches don't always work.

Touchdown on the touch-and-go (following an instrument approach) was about 3000 feet down the runway. The pilot applied power for takeoff and immediately raised the gear handle, and the hapless airplane slid to a stop some 2000 feet later. The IP cut the throttles, pulled the T handles and raised the canopy, and both pilots got out of the airplane. About two minutes later the airplane was engulfed in flames and was a total loss.

All the safety devices in the world cannot replace the grey matter between the ears. With the brain in stopcock, you're an odds-on candidate for an accident. This fellow was elected.

A TWO-HOLER IN ONE

The Gooney Bird had just pulled out of the chocks, and the crew had completed the brakes check. The pilot taxied forward until the copilot, observing the wing-walker's signal, gave the order to stop. The wing-walker walked directly under the wingtip to check the clearance, then signaled that the crew was clear to taxi forward and turn left. The copilot told the pilot that he had about five feet clearance and that a hard left turn was needed, so the pilot added power on the right engine, unlocked the tailwheel and released the right brake.

The aircraft had just started to turn left when the right wingtip hit a latrine building. Both the marshaller and the wingwalker were signaling to come forward at the moment of impact.

There's nothing really complicated about the rules governing the ground handling of aircraft. If you're 25 feet away from an obstacle, you can taxi. If you're ten feet away, you need a wingwalker to taxi. If you're closer than ten feet, shut down and ask for a tow.

A small portion of common sense would have made life easier for a whole lot of people—especially that poor guy in the latrine.

CANCEL IFR

An Air Force transport aircraft was approaching one of our larger military bases. It was night, and the pilot may have been in a hurry to get it on the ground before the club closed. For whatever reason, 20 miles east of the field the pilot asked Approach Control to cancel IFR and requested a visual approach to landing. Approach Control approved his request (Approach Control really had no choice) and, when the aircraft was ten miles east, instructed the pilot to contact tower.

The pilot called the tower and a short time later reported four miles on final. Tower advised him to check wheels down, that he was not in sight, and cleared him to land.

Moments later the tower controller asked the pilot to show a landing light—and the pilot replied that his lights were on! The controller immediately advised the pilot that he was *not* where he said he was, and that possibly he was lined up on a small civil airfield six miles south.

A telephone call to the civil tower confirmed suspicions. The jet transport had progressed to about a half-mile final (to a 4,000 foot strip) before going around. Fortunately, there was no conflicting traffic at the civil airport.

FAA (and some military) approach controls use visual approach procedures quite effectively to expedite the flow of terminal traffic. But pilots flying into congested, high-density areas at night should think twice about requesting or accepting this type of approach—especially when there are instrument approach aids serving the same runway. As this case shows, orientation can be a problem.

TAKEOFF FACTOR

A recent incident involved one of our STOL aircraft which went through a fence at the end of the runway. Conditions were normal—the same as they had been for many other takeoffs, EXCEPT:

- There was a slight tailwind factor.
- The ambient temperature was much higher.
- The last 327 feet of the 1400-foot runway was unusable due to recent rains.
- Runway condition was soft, with uncut grass 18 inches long for the first 200 feet and six to eight inches long for the remaining runway.

Nobody has yet been able to provide us with a chart to compensate for wet, uncut grass, although older heads have advised that that condition alone was probably enough to have caused the incident.

Admittedly, the problem of compensating for grass condition isn't one which confronts us on a daily basis. But the problems of compensating for non-standard conditions do confront us daily—and complacency can raise its head and bite us anytime we care to give it the opportunity.

Take a closer look the next time "everything's normal —EXCEPT . . ."

FLIP CHANGES

Establishment of Defense Mapping Agency (DMA): Department of Defense Directive 5105.40, dated 1 Jan 72, established the Defense Mapping Agency (DMA) by combining the separate Mapping, Charting, and Geodetic organizations of the Military Departments. Effective 1 Jul 72, USAF Aeronautical Chart and Information Center was redesignated as:

Defense Mapping Agency
Aerospace Center,
St. Louis AFS, MO 63118

Under the direction of the DMA, the Aerospace Center will continue to manage the DOD Flight Information Publication (FLIP) Program to assure accurate and timely flight information is provided to the U. S. Military aviation community. Current policies regarding the distribution and requisition of DOD FLIP products remain in effect.

CORRECTIVE ACTION OF THE MONTH

"Pilots of this unit will be briefed not to depress bomb button unless ordnance is to be dropped."

Ops topics

CONTINUED

BIKE STRIKE

The Gooney Bird was headed home after completing the mission, but found the way blocked by an extensive line of thunderstorms. The pilot first attempted to climb over the top (!), and when that failed he entertained briefly the idea of slipping underneath. Radar showed a solid line, however, so the pilot retrenched and came up with a third alternative: spying an airfield on his side of the storm line, he decided to set down and wait it out.

He flew the plane to an 85-knot full-flap final approach. Touchdown was good—but during the rollout a motorcycle with two people on it crossed in front of him. The pilot yanked back on the yoke and firewalled the throttles, and managed to clear the cyclists. But he stalled out and contacted the runway again in a right skid, applied brakes and tipped the airplane far enough forward to take both props off.

Probably no "normal" situation is more ripe for an accident than the unplanned diversion to an alternate. Certainly the pilot has the responsibility to be aware of changing conditions and to keep his mental "contingency plan" updated. And certainly the pilot must be aware of the hazards involved in a hurried landing at an uncontrolled airfield.

But this accident probably could have been prevented at the supervisory level, through increased control and a comprehensive diversion plan.

IFR (I follow river)

The O-2A pilot departed an Air Force Base, heading back to home station. He'd filed a VFR flight plan and, after takeoff, he flew north until intercepting a major river which guided him west to his destination.

Now, this is what FACs are supposed to do. It's essential to FAC operation that the pilot be able to navigate solely by pilotage and terrain reading. Rivers, of course, are very good for this sort of thing; they don't change much, except in extreme flooding and such, and they usually offer many distinctive landmarks for pinpointing one's position.

Even so, the pilot almost didn't get home. And he almost didn't make it because he hit a powerline across the river—*at about 65 feet AGL!*

Pilots complain loud and long about the gradual extraction of decision-making authority away from the cockpit. But it's surely irresponsible behavior such as this that makes the increased supervision a tempting alternative. One instance of blatant unprofessionalism —such as this one—hurts every pilot in the force.

CONTROLS FREE?

Day in and day out, pilots pull, push, and twist the controls and never really expect them to operate in other than a normal manner. Imagine the surprise of the B720 captain who accelerated 210,000 pounds of aeroplane to its V_R of 131 KTS, applied back pressure and found he couldn't move the elevator column! The takeoff was aborted successfully by using both full reverse and hard braking.

Investigation revealed the elevator control crank had been installed upside down during maintenance service just prior to this "flight"!

(Flight Safety Foundation)

DOING THE JOB

There it sat on the runway, the dust settling around it; a jet fighter resting firmly on its main gear doors.

There was no evidence that the gear folded after touchdown. In fact, the pilot admitted that the first time he *really* checked the gear indicators was when he heard that awful scraping sound. The people in mobile control stated that, just before touchdown, they noted that "something was wrong" but didn't have time to do anything about it.

It appears that, once more, complacency rose up and socked us in the nose. The pilot *assumed* that when the handle went down, so did the gear (the warning horn was inop). The mobile controllers *assumed* that when the gear started down in the base turn, everything would be ops normal.

And each of them *assumed* that the other guy was doing the job. ★

TOOTS



is interested in your problems. She spends her time researching questions about Tech Orders and directives. Write her c/o Editor, Aerospace Safety Magazine, AFISC, Norton AFB, CA. 92409.

Dear TOOTS

I am confronted with a problem affecting all the SAC units concerning installation and removal entries of engines installed on aircraft. Being in a position to review all SAC unit engine jacket files, I see no uniformity whatsoever.

We have been using the AFTO Form 98 for all installation and removal entries of B-52 and KC-135 aircraft engines. TO 00-20-5, paragraph 3-38, states the form is optional for use on all except T-76 engines. I cannot find any reference stating the AFTO Form 98 will be used for engine installation and removal entries in conjunction with the engine AFTO Form 95.

There are also no references in TO 00-24-4 saying these entries are required, although paragraph 2-12q 1 through 6 spells out clearly that installation and removal entries are required on the AFTO Form 95 for Continental Packette engines installed in AGE.

I feel a true readout needs to be accomplished so a uniform system can be achieved throughout SAC and other commands. Should these entries be required on the AFTO Form 95? I would gladly submit an AFTO Form 22 requesting a change to TO 00-20-4 saying "installation and removal entries on engine AFTO Form 95s are required."

SSgt Arthur W. Martin, II
307 Strategic Wing
APO San Francisco 96330

Dear Art:

You're right, the system appears to be unclear. I talked with AFLC and they agree and are considering a change to 00-20-4 requiring the use of the AFTO Form 95 to record all engine removal and installation. However, I recommend that you submit an AFTO 22 in support of their considerations.

Thanks for writing.

Toots

Dear TOOTS

I am very concerned about the policy governing aircraft overflights on runways during hot convoy crossings. This base presently permits direct overflights of down to 1000 feet.

Being a frequent convoy commander, I am convinced that a serious potential accident situation is created when aircraft are permitted to fly over the runway at an altitude during convoy crossings—especially those involving explosives. Once the control tower gives clearance for a convoy to cross, it would seem logical to assume exclusive priority of the runway (outside of emergencies) from ground level up.

I have personally experienced an incident where an A/C on runway approach with landing lights on, shook convoy personnel so badly that the tow vehicle operator refused to cross the runway. When questioned, tower merely announced that the A/C was under their control. A convoy crossing takes maybe five minutes or less. Isn't it worthwhile to give priority to an explosives convoy and get them out of the way first (except when an A/C emergency exists), rather than to compromise safety and have two runway situations existing simultaneously? Convoys enroute to alert A/C and mass load areas may be carrying nuclear weapons. I believe nuclear safety should merit precedence over routine A/C situations—especially when the time factor is so small.

AF Form 457 was not submitted on this item because the base is aware of the situation and has already established policy, which in my opinion is unsatisfactory. I think the problem should be looked into and perhaps investigated for safety's sake.

Convoy Commander

Dear CC

Your letter stirred a lot of research for many!

It looks as though you have identified a very real hazard—and the solution. Overflight at 1000 feet seems reasonable, since aircraft can fly that low anywhere. In fact, since traffic over the runway is controlled, you may even be safer.

Low approaches—so low as to scare the troops—are something else. Under those conditions, an error in judgment or a mechanical failure could be disastrous.

If the Base Reg says "1000 feet" and the birds are flying lower than that, you need to make a fast visit to your friendly safety office.

Give the Safety Officer the story, and he'll run with it!

Toots

Tech topics

briefs for Maintenance Techs

missing wheel bolts

Did you ever have the feeling that the bird was trying to tell you something? Here's a KC-135 that tried real hard but maintenance took a while to get the message.

On the 17th of the month, the Nr 7 brake was changed. Now everyone knows that to change a brake the wheel must be removed; however, no form entry was made to that effect. So we must assume that after wheel replacement the work was never inspected. Thirteen days later the aircraft was written up for slight brake chatter during taxi. Corrective action was to bleed the brakes. Ten more days went by and the brakes were written up again: "Right brake chatters severely at low taxi speed." This time Nr 8 anti-skid detector was replaced.

Two days later, following touch and gos and a full stop, a crewmember reported vibration in the right main gear area. The pilot felt that the brake was grabbing or a tire was low. After engine shutdown, the axle, bearings, anti-skid and retaining nut were found to be extensively damaged. The cause: the axle nut retaining bolts were not installed when the wheel was replaced following brake change.

Read on. This unit inspected all installed wheels and one other KC-135 was found with the retaining nut bolts missing from one wheel. The nuts had backed off approximately 8 turns.

Needless to say, had the proper form entries been made, this incident could have been prevented. One good thing came to light from this episode: it focused attention on the reliability of this unit's forms maintenance and inspection system.

FOD strikes again

As the B-52 lifted off, both drop tanks departed. The aircraft was flown for 2 plus hours to burn down fuel, then landed without further incident.

The cause: a piece of steel safety wire had shorted the X1 to B1 terminals on the R2-94 drop tank relay in the forward wheel well. Aluminum shavings and a washer were also found in the immediate area. This should be a reminder to every maintenance man of the critical need to account for every piece of material when a job is completed.

T-29 AG oil line leak

During postflight inspection at a transient base, the AG (alternator-generator) pressure manifold-to-return line was found leaking. The line was removed, used as a sample and a new line made, installed and pressure checked. Next day the T-29 returned home where the line was inspected and found okay.

Nineteen days later the same line was found ruptured on preflight. A new line was made using the old line as a sample.

Seven days later the line was found ruptured on postflight—again at a transient base. The line was used as a sample to make two lines, one to install and one as a spare.

Two days later the same line and same problem. This time the aircraft was grounded pending a positive fix.

The spare line was checked and found to be one-fourth inch short of tech order specifications. Since all lines were made using the failed line as a sample, it is believed that all were short, causing overstress of the flare when torqued. A new line was made to tech order specifications, tested to 4000 psi on a test stand, installed and pressure checked satisfactory.

This T-29 flew one local flight and at last report was on an extended cross-country and the ruptured line problem appeared to be cured. Too bad these troops didn't get the tech order specifications to begin with. It would have saved a lot of time and effort.

crossed cables

The F-105 was in a 30 degree left bank at 350 knots when the rudder went full right, then full left. The emergency AFCS disconnect was pulled and the aircraft settled down with the ball about halfway to the right of center. A visual check showed the rudder to be four inches left of center. The rudder would tend to center, then oscillate back and forth causing fishtailing. The load was jettisoned, a controllability check performed and landing accomplished at home base.

The cause: the aft section had been removed for maintenance prior to this flight and during reinstallation, the rudder cable and drag chute cable were crossed where they pass through the split line. The rudder cable had become shredded which caused binding in the bulkhead holes. This binding resulted in erratic movement of the rudder. Needless to say, proper routing of the cables would have prevented this incident.

out o' spacers?

Word comes to us from one of our TAC bases that some T-33s and T-39s (transient type) have not had proper tire maintenance performed. In changing tires on some of these airplanes it was noted that some were not equipped with a wheel spacer that is required by TO W1-7-1313. This spacer is required to be installed between wheel halves to prevent a reverse bending load through the web area which can result in fatigue cracking radiating from the axle hole. This can lead to complete failure of the wheel and you know what that can lead to.

A quick check now can eliminate a lot of grief later.

(TAC ATTACK)

tech data

With all the tech data and servicing equipment available, we still have some crew chiefs who think that the eye is better than the gage, and proceed with total disregard for tech data.

In one such case a crew chief noted that the main upper strut cylinders were low. While servicing the upper strut he did not use a direct reading gage, nor follow tech data. He had performed this job many times before and knew exactly how to do it.

Just after takeoff, when the pilot selected gear up, an unsafe indication was received in the cockpit. The wing man confirmed that both main gears were overextended and had contacted the inner doors. The gear handle was placed down, the mission aborted and the aircraft returned to base.

The overserviced condition of the upper strut had caused both shrink rods to fail during retraction. Needless to say, the use of proper servicing equipment and tech data would have prevented this incident and a lot of red faces.



Note in this photo the wheel spacer is missing.



Here's what it should look like with the spacer properly installed.

Tech topics

they had it wired

During an F-106 practice intercept mission at 345 knots, the landing gear unsafe warning bar illuminated, and the left main gear extended. The target aircraft confirmed that the left main was, in fact, extended and the inner fairing door was missing. The emergency extension was selected and the aircraft returned to base with three in the green.

This incident began when the bird was placed on the trim pad for maintenance troubleshooting. The left main gear door switch was safety-wired to the closed position to burn down fuel in the drop tanks. No entry was made in the 781 concerning the saftied switch. After maintenance was completed the wire was not removed. The crew chief and pilot both failed to detect the saftied switch on their preflights.

During gear retraction after takeoff, the gear hydraulic system depressurized as soon as the right main gear door switch closed. Most likely the left main door lock had not completed its travel when the system was depressurized which allowed the door to open under airload.

no training this flight

A T-38 was in the hangar for scheduled maintenance to replace the gear handle interconnect cable.

Both seats and canopies were removed by egress personnel; the rear cockpit control stick horizontal tail control rod was disconnected at the control stick end by a mechanic who then went to the shop office to make the appropriate form entries; however, he entered the discrepancy in the wrong aircraft form.

Work progressed through the day and the job was turned over to the night shift at 1600. The night shift completed installation of the gear handle interconnect cable but failed to notice the stick control linkage disconnected. The supervisor who cleared the work also failed to detect the disconnected linkage. A gear operational check was completed, seats and canopies installed, forms checked, all discrepancies cleared and the aircraft was called in operational.

Next day the bird was scheduled for a student training sortie. The before taxi flight control check by the IP in the front cockpit appeared normal. During takeoff roll the student could not get rotation, so the IP took control at 180 knots and climbed to a safe altitude, performed a controllability check and took the bird safely home to maintenance.

Could poor forms management and/or inefficient supervision lead to such an incident as this in your organization? This is a very good example of how a seemingly small error can lead to a dangerous in-flight emergency.

fuel contamination

Investigation into a major aircraft accident which occurred following a double flameout disclosed some interesting information about fuel sampling.

In one experiment conducted by the board, a 230 gallon external tank—of the type used by the accident aircraft—was filled with 220 gallons of JP-4. The filler cap was replaced but left unlocked. During the next hour eight gallons of water were poured into the tank, despite the presence of the filler cap!

With the same technique used by crew chiefs on preflight, samples were taken from the drain. The samples drawn were clear—like JP-4; they smelled like JP-4; they tasted like JP-4; they felt oily like JP-4; but they were nearly 100 percent water.

Since JP-4 contains no dye, a container of JP-4 and a container of water look alike. A careful visual inspection will easily pick up a mixture—say half and half, of water and JP-4—because the liquids will separate. But a crew chief looking for two obvious liquid layers in a sample could easily mistake a nearly pure water sample for JP-4.

Surely the easiest way to avoid fuel contamination of this sort is to make sure that the filler caps are locked down tight—always. If there is any doubt of JP-4 being contaminated with water, follow the procedures in TO 42B-1-1, paragraph 5-46 (Water Content of Aviation Fuel).

free floating aileron

Immediately after takeoff the KC-135 began a left roll, which was corrected with rudder and aileron. The pilot climbed to a safe altitude where visual inspection showed the left outboard aileron to be high.

The pilot tried every possible procedure, including flap repositioning and turns, but the left aileron never moved. Fuel was dumped, and after a controllability check a safe landing was accomplished.

What did they find? The left outboard aileron lockout link had disconnected from the control rod. This allowed the aileron to free-float, regardless of the flap position. During flight, air pressure in the balance bay forced the aileron up, giving the rolling movement.

This was the first flight following phase inspection, during which maintenance was accomplished in this area. Come on Maintenance, surely you can do better than this! Where was quality control when this bird was paneled up?

throttle rigging

Almost daily there are incident reports of improper or incomplete throttle rigging. After all that has been said in the safety manuals and magazines and the emphasis that is placed on the use of tech data and supervisory inspections, there still seems to be those who don't get the word. Here are a few examples:

- A C-47 IP was demonstrating a full flap pattern and landing. When the throttles were advanced to adjust airspeed, Nr 1 engine failed to respond. The throttle control rod lock nut was not properly torqued during maintenance. The nut backed off allowing the linkage to disconnect.
- Nr 1 engine on a B-52 could not be retarded below 88 percent. The throttle control rod bolt was improperly installed and came out in flight.
- When a C-130's engines were reversed on landing, Nr 3 lost power and flamed out. Improper rigging of the fuel control caused this one.
- Nr 1 engine on a T-37 flamed out when the throttle was advanced to 60 percent during start sequencing. The throttle rigging was out of limits.

In each of these incidents maintenance goofed. Proper use of available tech data and a sound supervisory program would have prevented every one.

pay attention

The Sarge had just completed the flap security and boundary layer control check at the half-flap position. With his right hand resting on the edge of the flap, he gave the crew chief (who was on the headset) the All Clear sign, which the crew chief, in turn, passed to the pilot of the RF-4C. The pilot moved the stick, the aileron moved down and the sergeant's fingers were pinched between the aileron and flap. Although the man's fingers were lacerated, they were not completely severed.

And just think—he gave the signal himself!

foaming oil—A-7D

After fifteen minutes of flight the oil pressure started fluctuating three to five PSI and slowly dropped from 32 to 22 PSI for 30 seconds, then returned to normal. This pressure fluctuation and drop occurred three times before the pilot got back on the ground.

Foaming oil caused the problem. The A-7 has a smaller oil tank capacity (1.20 gallon usable) than most aircraft; therefore, it is more susceptible to oil foaming problems.

Agitating the oil can before servicing will insure that the heavier silicone anti-foaming agent is mixed with the oil. A requirement is forthcoming in a change to TO 1A-7D-2-1 which will require agitating the oil before servicing.

overserviced strut

When the OV-10 pilot raised the gear handle after takeoff, the nose gear indicator showed unsafe, the handle warning light was on and the hydraulic pump continued to run.

Attempts to recycle the gear with the pump on and off were unsuccessful, as were "G" maneuvers. A chase aircraft confirmed the intermediate position of the nose gear, so the pilot landed on a foamed runway with a partially extended nose gear.

This incident was caused by a mechanic who overserviced a strut with hydraulic fluid, which prevented its normal extension during retraction. The strut assembly then contacted the door linkage bracket and jammed.

Remedy: Follow the TO. ★



NUCLEAR SAFETY AID STATION

KEEP IT IN NEUTRAL



During a download, the weapon had been lowered on a lift truck below the aircraft bomb rack. Before the pullout cable could be disconnected, the driver momentarily let up on the clutch with the gear shift in reverse. Although the lift truck wheels were chocked the movement of the truck was enough to damage the break pin on the pullout connector. To stress the obvious—keep the gear shift in neutral anytime a bomb is being raised or lowered.

DON'T BANG THAT BOLT

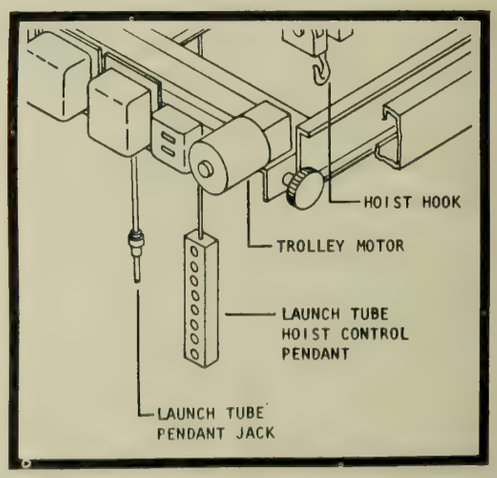


While changing wheel bolts on a Model 3030 Aircraft and Missile Engine Trailer, Munitions Maintenance Squadron technicians noted cracks radiating from four of the five lug bolts to the perimeter of the aluminum hub. A check of all other assigned 3000 and 4000 series trailers turned up two more damaged hubs. In response to the EUMR, WRAMA replied that one crack per bolt hole in aluminum hubs is acceptable, in accordance with TO 35D3-26-11. These cracks will be found mainly in hubs made before 1964 when a new specification increased tolerances on the bolt holes.

All well and good. Then why are we discussing this? Because several of the cracks were caused or accelerated by a maintenance man using a hammer to install the lug bolts, rather than taking the time to have them pressed in. Nuclear safety requires total elimination of short-cut procedures and improper tools. And DON'T BANG THAT BOLT!

AND THE CHIPS FLEW

During a routine missile guidance set recycle which included a reentry vehicle (RV) removal, a screw fell out of the hoist control pendant, Figure 1-6, TO 36A9-8-40-1. The hoist control pendant cover separated from the pendant body. The technician applied external pres-



sure with his hands to remate and hold in place the cover and pendant body, but the cover slipped and contacted the down button. The action of depressing the "fast-down" switch lowered the RV to the floor of the van, which damaged the RV.

WHEN WILL THEY EVER LEARN?



So goes the chorus of an old popular song. The estion here is: When will we ever learn to follow hnical orders step-by-step and avoid unauthorized cedures? Cases in point:

• Two technicians thought they were following the , but missed several steps after completing part of work. The result was improper status indication on e missiles, loss of alert time, and another Dull rd.

During a parachute change, a weapon technician lied force on a shoulder bolt and self-locking hex rather than on two internal wrench bolts as directed he TO. The shoulder bolt sheared off, requiring tional maintenance and another Dull Sword.

During another parachute change, a self-locking plate was found cracked and with stripped threads. able cause was listed as failure to inspect for burrs foreign materials (as called for in the Dash 1 TO) or overtorque.

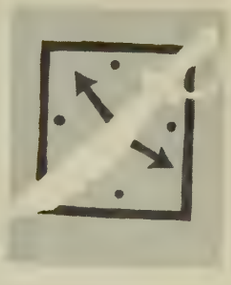
hen will we ever learn:

To do *everything* the TO says and in the proper ence?

To avoid unauthorized procedures? As the Direc- f Special Weapons at one Air Force Base stated, TO can't possibly list them all."

Not to skip parts of any procedure? Mark or steps as performed. Paper clips, pencils, erasers, common sense are cheap. Nuclear accidents/inci-/deficiencies (AIDs) are not.

DULL SWORDS- 48 HOURS



AFR 127-4 requires Dull Sword reports to be submitted within 48 hours after the deficiency is noted. The Directorate of Nuclear Safety records show some units delay submitting reports.

Rationale given for the delays falls into three groups:

- Additional investigation was necessary.
- Another base or safety office was asked to submit the report and failed to submit it on time.
- No reason included, just late.

"Additional investigation needed," is not a valid reason for delay since it is conducted *after* the preliminary report, not before. If additional data is required, state on the preliminary report that this information will be forwarded when available. Your absence when the deficiency occurs is also not a valid reason since the responsibility for submitting timely reports is still yours. Follow up on "courtesy reports" that others say they will submit for you. The "no reason" response indicates poor management practices and a disregard for safety and authority.

The system is designed to conserve Air Force resources. Ensure that your Dull Swords are reported on time (within 48 hours after discovery), to the right people, and that follow-up action is taken when required.

Remember, deficiencies cannot be resolved in a timely manner unless they are reported promptly.

WRONG-WAY CORRIGAN

The Reentry System Convoy was enroute to a launch facility. Along the way they made a wrong turn on an unmarked county road and the rear wheel of the payload transporter became stuck.

The primary cause was personnel error in that the convoy commander turned into the wrong road. Contributing was the poorly marked route of travel. Launch facility markers are being constructed and will be strategically located in the missile complex area. ★





"ONE MAN AGE"

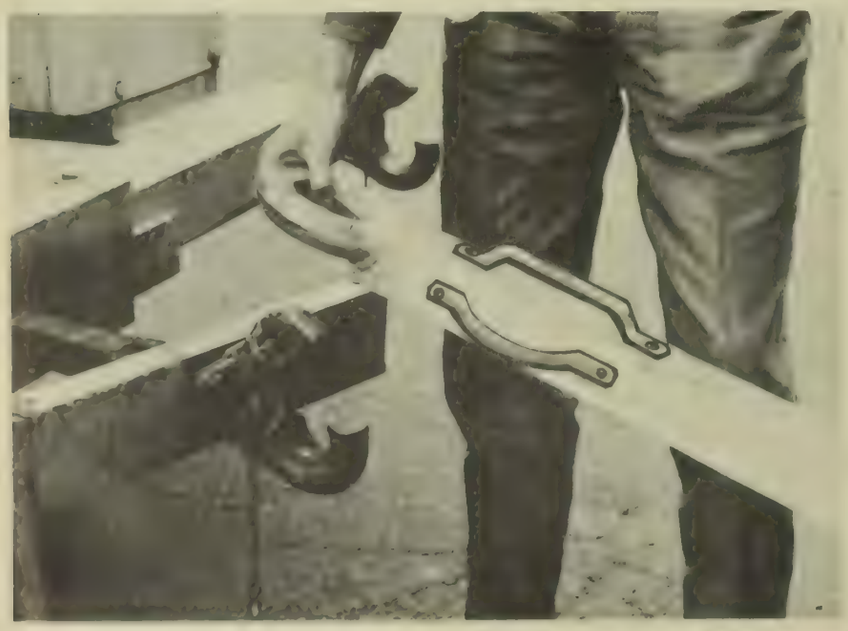
The photograph accompanying the article, "One Man AGE" in the May issue brought back memories of an accident which I witnessed at Furstenfeldbruck AB in 1949. (That's a long time to remember.)

In almost the same position as that in the photograph, I saw a young airman's hand crushed horribly when the CG of a heavily loaded trailer being hooked to a tug shifted as the trailer tongue was lowered toward the pintle hook. Holding the tongue in the manner illustrated in the photo, the unexpected downward momentum of the tongue and hitch, combined with the man's desire not to drop the tongue and upset the load cost him a finger and much suffering.

As a fix, we attached lifting handles to the tongue of every piece of AGE on the base (if not already installed). I sincerely hope your photo is not representative of the manner of handling this potential finger flattener.

Lt Col Henry C. Rhodes, Jr.
Patrick AFB, Fla.

Editor's Note: Your point is well taken. The photo illustrates what some outfits have done to eliminate the hazard.



"A MATTER OF HABIT

"A Matter of Habit" in the June issue hit a responsive chord.

Last year I was driving a farm tractor with a mower attachment when I stopped to talk with a neighbor. I put the tractor in neutral, disengaged the mower, and shut down the engine.



When I was ready to go, the neighbor's son was leaning on the mower with his fingers between the knives. Without giving the matter any conscious thought, *strictly through habit* with aircraft engines, I was unable to start the tractor until he was clear of the mower. When I finally started the tractor, I was startled to see the mower go into operation—a defective clutch.

Force of habit saved some fingers that day. If only all our habits could be good ones!

Thomas O'R Gallagher
ATR, Pilot Examiner
Sayville, NY

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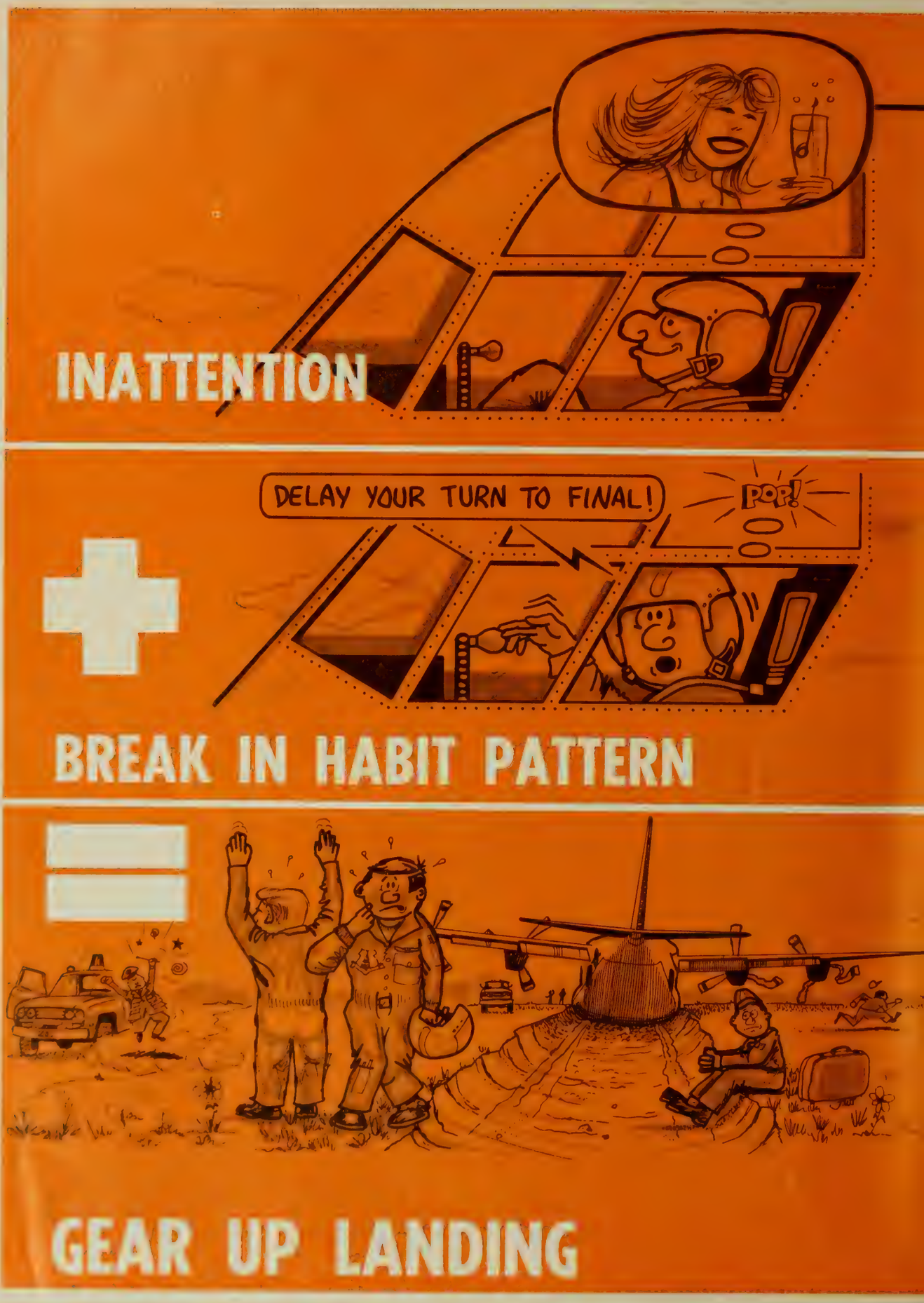
Captain JOHN M. O'NEILL

554th Reconnaissance Squadron, APO San Francisco 96310

On 2 November 1971, Captain O'Neill launched his QU-22B aircraft over a hostile area of Southeast Asia at night. During the climb, passing FL 110, Captain O'Neill noticed a drop in manifold pressure from normal climb power of 35 inches to 30 inches. He immediately followed specified emergency procedures for partial power failure and turned back to base. Thirty seconds later the manifold pressure dropped below 30 inches, and a heavy stream of sparks came from the left lower portion of the engine, followed by smoke and odors entering the cockpit. Taking immediate action Captain O'Neill checked that he was on 100 percent oxygen, ventilated the cockpit, and made an immediate decision to divert to an alternate airfield. Although the possibility of an inflight fire was imminent, Captain O'Neill stayed with his aircraft in an effort to make a safe landing. He then began his approach and called the controlling agency at a forward operating base for landing instructions. Although his radio transmissions were being understood on the ground, the ground controllers were forced to relay their instructions to Captain O'Neill through another airborne aircraft. He elected to land downwind so that his approach would avoid a high-density population area that lay directly beneath the active runway approach. At approximately eight miles from the runway a spiral descent was established, and an emergency landing pattern was begun 3000 feet over the runway. A high sink rate was encountered, and when Captain O'Neill attempted to increase power there was no engine response. Captain O'Neill then raised the landing gear, and on short final lowered full flaps and extended the landing gear just before touchdown. The landing was completed and the aircraft stopped without further damage.

Captain O'Neill saved a valuable combat aircraft. A study of the fleet led to discovery of flaws, similar to the one that caused his problem, on other aircraft, which prevented further damage to those and possibly saved the lives of other pilots. WELL DONE! ★

* * * * *


INATTENTION
DELAY YOUR TURN TO FINAL!
POP!
BREAK IN HABIT PATTERN
GEAR UP LANDING

G29.7S05
FLYS

UNITED STATES AIR FORCE • NOVEMBER 1972

Aerospace Safety



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Aerospace SAFETY

FOR AIRCREWS, MAINTENANCE & SUPPORT TECHNICIANS

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NOVEMBER 1972 AFRP 127-2 VOLUME 28 NUMBER 10



A CASE OF ASSUMPTIONS

In the summer of 1971, a transport aircraft struck the approach lights during takeoff. The crew continued takeoff and, after inflight inspection for damage, dumped fuel and returned for landing.

* * *

There were actually two accidents in one! The aircraft struck the approach lights during rotation and liftoff, damaging the landing gear, flaps, and fuselage. Pieces of the approach light structure penetrated the cabin, inflicting leg injury to one passenger and arm injury to another. Other debris disabled three of the four hydraulic systems.

On landing, elevator authority provided by the single remaining hydraulic system was not sufficient to prevent a hard landing and loss of control.

* * *

And now to our story:

• On the day of the accident, the airport management initiated a NOTAM to close the longest runway for maintenance; however, this was changed to an AIRAD (Airman Advisory) instead.

ASSUMPTION: *The management* assumed *that when a NOTAM was requested it would be published! Do* you *follow up?*

• Since the flight planners were not aware of runway closure (they receive NOTAMs but not AIRADs), they loaded and planned a long runway takeoff.

ASSUMPTION: *The situation is always normal unless a cue to trouble develops! Is your problem-cue system adequate?*

• The copilot became aware of a problem when he listened to the ATIS broadcast which told him that Runway 28 left was closed. He asked for 28R, but the pilot, after checking with the flight controller, decided to use Runway 01.

ASSUMPTIONS: *The copilot assumed the pilot had heard the ATIS message, and the pilot assumed the flight controller had checked his planning. Do you* assure *positive communications?*

• The tower cleared the aircraft to take off on Runway 01, although the wind of 270°/22K exceeded the "Recommended crosswind limitation."

ASSUMPTION: *If the pilot doesn't like the crosswind, he'll say so.*

• Runway 01R is 9500 feet long, but has a displaced threshold to reduce blast effect on a nearby freeway. The flight controller checked with the tower operator concerning a Runway 01R departure; the tower operator confirmed that the first 1100 feet were unusable, and the flight controller interpreted this as confirmation that the published 9500 foot length was correct.

ASSUMPTION: *Tower assumed the controller knew of the restriction, and the controller assumed that any restrictions would be taken into account before runway lengths were published. Could this problem exist at your base?*

• The flight dispatcher considered takeoff on Runway 28R on the basis of a 9700 foot length shown in the route charts. The FAA master record changed the runway length to 8896 feet. The FAA said the length was actually 9496 feet, and the investigators **measured** 8898 feet.

ASSUMPTION: *What is in print is true. How sure are you of the lengths, clearances, and such at* your *air base?*

• Passengers had difficulty with life vests, since they were different from those demonstrated by the cabin crew before takeoff.

ASSUMPTION: *The one who wrote the briefing* must *have known what equipment was on board.*

• After the crash landing, which took the aircraft off the runway, there was a delay in abandoning the aircraft. The copilot made the announcement, but his selector was set on tower frequency instead of "Public Address."

ASSUMPTION: *I will remember to turn back to "PA" after landing. Do you trust to memory when the chips are down?*

* * *

The airplane was repairable; there were no fatalities but 29 were injured, two in the first collision and 27 in the egress.

A long list of ASSUMPTIONS led to the accident, any one of which, if questioned, could have led directly to prevention.

Have you questioned any assumptions lately? ★



FOR PILOTS

By now all units in cold areas should have their cold weather operation plan worked out and, in many places, functioning. If you've had experience with cold weather aircraft operations, then you know what to expect and can help the new guys. If all your experience has been in a warm climate, don't be bashful about asking the old heads for advice.

One of the things they'll tell you is to sharpen up on your landings. Seems like every winter we get a few guys sucked in on short landings, and some others go sliding off the side or the far end. Unfortunately, our winter procedures are not so perfect that we can take anything for granted. So with slick runways and low viz, it pays to *carefully* compute landing distance. At hand is a chart which says that landing distance increases:

- 3½% with each 1000 feet elevation
- 10% with each 10% of gross weight (which increases landing speed).
- 25% with each 10% increase in touchdown velocity.

With these figures in mind, it is easy to see that an unwary jock could land a bit long and find that his stopping distance would exceed the length of the runway.

On the other end of the stick is the guy who lands short. This has happened when the overrun is covered with snow and the visibility is poor. This may not result in an accident, but it could. Consider: snow has been removed from the runway but not the overrun and some has been thrown into a pile or ridge across the overrun. This alone may be too much for the landing gear, but a bit of thawing during the day followed by freezing at night could make that snow ridge something like a brick wall.

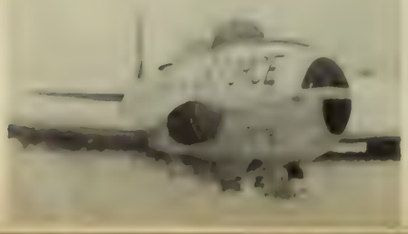
Stopping distance just naturally has to increase on a slick runway. So it would be handy to know what that distance might be. At best that's an inexact science. Therefore, there's going to be some guesswork. For years we've worked with RCR, but the latest studies indicate that RCR is not accurate for wet runways, although it can be very good for ice and snow conditions. Until we have something better, the pilot gets an automatic RCR of 12 when the runway is wet. Bear in mind that some of our runways have a wet to dry ratio of 3:1 and plan accordingly.

Remember that what IS and what you think you see may not be the same. Blowing snow may obscure approach and runway lights. Snow may cause poor definition of the runway. Water draining from melting snow can produce a hydroplaning situation where braking is practically nonexistent. Patches of ice, snow and dry pavement make getting a valid RCR very difficult and can fool the pilot. You can't always see the patches.



Taxiing mistakes are a frequent contributor to winter accidents. Nosewheel steering may be ineffective and braking very poor. The key word is SLOW. In fact, when conditions are really bad, it could be wise to shut down and let them tow the bird out. Cornering is a big problem when traction is poor. If yours is a many motored bird, differential power can help you get around the corner. You should use as big a turn radius as conditions permit and avoid braking while turning. Thrust should be kept at minimum, both for speed control and to minimize blowing ice chunks or slush. Be very





cautious on crowned and sloping surfaces and watch for ice patches caused by jet blast from the other aircraft. A word to the wise: Now's the time to carefully study the Dash One and talk to those with more experience.

When it is bitterly cold, it is only human to want to get away from the bird and to a warm building as soon as possible. But don't let this cause you to shortcut the 781. It's just as important when it's cold—even more so—to write up any squawks in necessary detail to help the maintenance types. After all, you might be the next guy to fly that airplane.

Over the years thousands upon thousands of words have been written about having and wearing proper clothing for the conditions to be encountered. It wouldn't seem that this would be necessary, but many individuals considered to be intelligent and well-trained have demonstrated the need for frequent warnings. Simply put, WHEN IT'S COLD, DRESS FOR IT. Furthermore, if you carry passengers, see to it that they are properly dressed and that adequate survival gear is on board. Of course, no matter how good your gear is you have to know how to use it. A case to the contrary was the pilot who wore his quilted underwear on top of his NOMEX flying suit. He had an accident, the bird caught on fire and the top layer melted and fused to the NOMEX. He was badly burned. Little things like that can kill you.



Because we operate so many different kinds of aircraft under varying conditions, there isn't room here to cover every possible situation. The following is offered as a guide only, and we suggest you check your command regs on proper clothing.

EXTREME COLD

Alaska, Canada, Northern US, Korea, Mountain areas, etc.

Underwear, don in order listed:

- Waffle-weave undershirt and drawers.
- CWU-9/P quilted insulated underwear.

Flying suit:

- CWU-27/P or 28/P augment with F-1B or CWU-18P trousers for added protection.

Jacket:

- N-2B, N-3B, MA-1 or CWU-17/P.

Gloves:

- HAU-11/P NOMEX (for wear during flight).
- N-4B (carry for survival use).

Boots:

- N-1B Mukluk or rubber "bunny boot" with insole, ski socks and/or felt socks.

Hat:

- B-9B (carry for survival use unless N-2B or N-3B jacket is worn).

INTERMEDIATE COLD

Underwear:

- Waffle-weave or CWU-9/P quilted.

Flying suit:

- CWU-27/P or 28/P.

Jacket:

- MA-1 or CWU-18P.

Gloves:

- HAU-11/P (for flight).
- MA-1 (carry for survival use).

Hat:

- Flight cap (carry for survival use).

FOR CIVIL ENGINEERING



Winter is not insurmountable, but it presents some problems. The following certainly does not cover every conceivable problem, but the idea is to trigger your thinking so that you will be prepared to meet whatever conditions you will encounter during the cold months coming up.

Presumably by now all snow removal equipment has been put in top shape, ready to go with the first falling flakes. At many bases snow markers must be erected, alternate routes mapped, marked, and publicized. Sufficient stocks of sand, deicing fluid, urea and other materials for treating runways, taxiways, ramps and roads should be in stock.

There were probably a lot of personnel replacements during the summer, so vehicle operators must be checked out before first snowfall, not only on the equipment but on flight line operation procedures, with emphasis on driving on slick surfaces and coordination between drivers, base ops and the control tower.

Drivers should understand the insidious effects of carbon monoxide in closed vehicles or operation with defective exhaust systems. Briefings should include a warning on what frozen metal will do to warm, exposed flesh and an explanation of

WINTER WISDOM

CONTINUED

chill factor. We have to prepare the man as well as the equipment.

Our ground troops are very important people at all times but their efforts are especially appreciated when winter weather gets really nasty. That's when pilots need all the help you can give them. For example, lights become very important. When snow is blowing across the runway, the runway lighting system may be the only reference the pilot has. Inspect runway lights, replace cracked lenses and set up periodic cleaning schedule. Check and clean the VASI system, check the intensity of approach and strobe lights.

The aircraft arresting system will need extra attention. During ice and snow removal, barrier nets and cables will have to be removed, but remember, the runway will still be operative and not NOTAMed. So be quick, but thorough and clear enough of the runway/overrun to allow adequate runout of the barrier plus the length of the aircraft.

When the runway is cleaned of snow and ice, allow for drainage. Standing water on the runway may be worse than ice or snow.





FOR MAINTENANCE

Good supervisors make sure their people are adequately clothed in extremely cold weather. But the supervisor can't keep an eye on every man all the time. The individual must take responsibility for himself. Normally, on the airbase frostbite should not be a serious problem, but the effects of cold will show in other ways. People will be tempted to take shortcuts to get back into the warmth of a building. This can lead to "quickie" maintenance preflights, especially if the men aren't properly clothed for extreme cold. Fingers tend to get stiff, which makes tool handling difficult. A man's attitude toward his work will cool as the temperature goes down.

This is a time of test for intelligent supervision. Supervisors must insist that their men have proper clothing and that they wear it. Sending a man to do a job on a freezing, windswept flightline in light clothing is asking for trouble. Work should be scheduled to provide adequate warming periods.

Cold, ice, snow, wind and slush produce extremely hazardous conditions on the flightline. Visibility is often reduced, and one doesn't hear as well with flaps over his ears. So you have to be more alert for moving aircraft and vehicles. Heavy clothing reduces agility. This and slick steps require a great deal of care when men are using workstands or working on aircraft upper surfaces.

Extreme cold brings some aggravating problems that must be dealt with. Tires stick to icy surfaces when aircraft are parked. Struts on an aircraft that is moved from the warmth of a hangar into the frigid outdoors will deflate and bottom. Seals leak. Tire pressure decreases. Oil congeals and must be warmed in some cases. Engines should be run at low power until the oil warms sufficiently to circulate freely.





These are just a few thoughts and there are a thousand things left unsaid. You who are experienced in cold weather will have to help the new guys. Some of them have never had the childhood experience of losing the skin off their tongue to a frozen pipe on the schoolground, or experienced the pleasure of ice skating on a pond in the park. They don't know what cold can do to men and machines. Let's not make them learn the hard way. ★

THE IFC APPROACH

By the USAF INSTRUMENT FLIGHT CENTER
Randolph AFB, Texas, 78148

INSIGHT TO VISIBILITY

With the advent of VISIBILITY ONLY criteria for filing, the pilot should be aware of what different visibilities really mean to him. He should consider how partial obscurations and low scattered cloud layers may cause effective visibility to be lower than reported. Let's examine the various visibilities and apply them to a situation.

PREVAILING VISIBILITY (PV)

is the horizontal distance at which objects of known distance are visible over at least half of the horizon. PV is reported in statute miles.

RUNWAY VISUAL RANGE (RVR)

is an instrumentally derived visibility measured along the runway and is reported in hundreds of feet when the prevailing visibility is less than one mile or the RVR reading is less than 6000 feet.

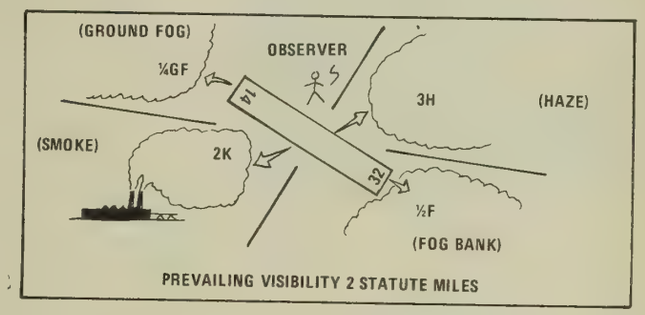
RUNWAY VISIBILITY (RVV or RV)

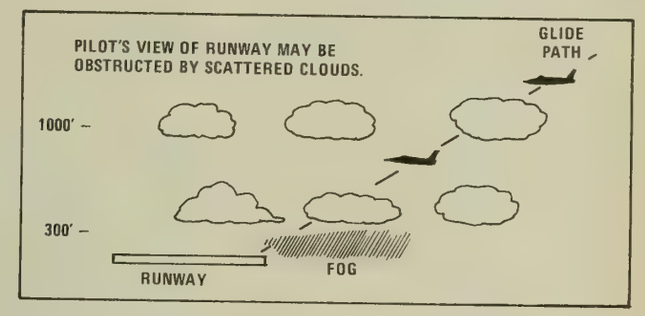
is the visibility measured along an identified runway and may be measured instrumentally or visually. RVV is reported in statute miles.

Visibility definitions are of little value to the pilot unless he knows how they are applied. Prevailing visibility, for example, doesn't necessarily represent visibility along the runway. It is used for all circling approaches and for straight-in approaches when RVR (or RVV) is not available. Additionally, PV is the only forecast visibility and is always used for the DD Form 175 clearance.

The Runway Visual Range value represents the horizontal distance the pilot will see down the runway from the approach end. A local and a teletype disseminated reading are taken from the RVR computer. The local value is based on current runway light settings and is transmitted to the pilot for his assessment of current field conditions prior to or during an instrument approach. The teletype disseminated value is transmitted on the aviation weather report, and may be used during pre-flight planning to compare visibilities (RVR vs PV). Since RVR values are not forecast, they cannot be used for filing purposes.

Now let's examine the weather pictures below and the corresponding Aviation Weather Report:





RND - X30MI00 02FK
54/53/3302/992
F6 R32V R16 VSBY NW $\frac{1}{4}$SE $\frac{1}{2}$

With a 1000 foot ceiling and two statute mile visibility, the pilot might consider the situation routine. However, there are several other significant factors to be considered.

1. RVR for the runway to be used is 1600 feet, which is comparable to one-fourth statute mile.

2. The partly obscured sky may further complicate the visibility picture.

In reality, the *effective* ceiling could be *less* than 300 feet and slant range visibility may be less than 1600 feet due to the partly obscured sky and scattered clouds. The 6/10 fog (−X) may reduce visibility by 50 percent or more as the aircraft passes in and out of the clouds and the pilot looks into the fog.

Keep in mind that these visibilities are ground observations and may not necessarily be what the pilot will see as he takes off or flies an approach. ★

YOU can prevent engine problems

A great many of our problems and malfunctions are repeatable and cyclic, regardless of which engines are discussed. We seem to find it necessary to reinvent the wheel periodically.

Look at a short list of items that immediately come to mind on which hundreds of words have been written:

Overtemperature
Over-torque
Use Jetcal analyzer
Route hoses and tubes correctly
Use TOs
Blend blades and vanes smoothly —don't notch
Don't use force
Stop FOD

How are those for a start?

Now, can you imagine how much money and time could be saved if these constant troublemakers could be eliminated?

The cyclic characteristics of the common problems are difficult to explain, but they just may indicate our "human-ness." We writers campaign for a while on prevention of FOD. You become FOD-conscious, the unscheduled maintenance rate drops, and we attack another problem. You hit that one hard, put FOD in the back of your mind, and the next thing you know the FOD rate is up again.

Then there's personnel turnover. The old hands move out and new ones come in. They're busy learning their jobs, and there's not yet time to be concerned about the refinements, so hats and streamers are sucked into engine inlets, or bolts are removed from the wrong flange of a check valve, or B-nuts are overtorqued to stop a leak.

We can steel ourselves to the fact that these problems fall into the category with death and taxes—we can't do anything about them.

Or we can recognize that these and some others are primarily people problems: *We* introduce foreign objects; *we* overtorque; *we* ignore TOs; *we* don't check clearances between hoses and other engine parts; and *we* can prevent all of them most of the time merely by knowing that they can happen if *we* get sloppy in our work.

Take a good look at this hose and



clamp. You've inspected many like them on your engines, and your view here is better than that which you'd have on an engine. What's your conclusion—are the hose and clamp good or bad? Now look at the photo below.



DID YOU PASS?

Same hose. Same clamp. And once again we find that appearances do deceive.

That's the message we're trying desperately to get across. Hoses and clamps are the kinds of things that we commonly look at, but don't really see. And if we do see them, we pass them as okay if they appear as the one to the left.

The additional step in removing the clamp to get a full view of the contact surfaces must be taken periodically. Otherwise, hydraulic fluid, fuel, or lube oil leaks are bound to occur as weakened hoses rupture.

During scheduled inspections and at other times when the engines are available, take a good look to ensure that there are no hidden leaks about ready to happen. (G.E. Jet Service News, Sep/Oct 1972) ★

YOU can prevent engine problems



REX RILEY'S CROSS COUNTRY NOTES

Ideas are one of our most important assets. We recently talked about the difficulty of servicing our recip fleet with oil when no oil truck was available. The troops at Luke decided to do something about this and the picture shows how. In short what they did was to locally manufacture an oil nozzle which screws on the five gallon can. The two nozzles were from "over the wing" fuel hoses. They enlisted the help of the machine and welding shops, had the nozzles reamed out to accept the caps. Then had the caps silver soldered into the fuel nozzles, and cut the top of the caps out. Nice going, Luke.



It's unfortunate that some bases have such good TA operation but are kept off the list because of unsatisfactory transient airman's quarters. We are starting to look more and more at this aspect of the overall transient service. Remember, it's the whole picture that counts, not just being a super gas service type operation.

Was transportation available to your passengers when you landed? Did you have a lengthy wait for fuel? To some extent it just might be your fault if you didn't get the treatment that you think you deserve. In response to a complaint, "no transportation available for deplaning passengers," an alert base ops type found that the reason for this was that no transportation had been requested in the Remarks Section of the 175. More research into the problem revealed that a significant number of pilots are not making use of the Remarks Section and therefore are not receiving the service they think should be available after landing. If you did request specific support as specified in the FLIP and then didn't get the service you have a valid gripe. Use the Remarks Section and help transient service plan ahead!

Clarification: In the August issue of the magazine I talked about a Code Seven that had some problems getting a discrepancy cleared on his aircraft. Sorry if I left the impression that he did not enter this in the 781. He did. The problem was that even after writing it up and reminding TA that he needed some maintenance it was overlooked, which resulted in a delayed takeoff. ★

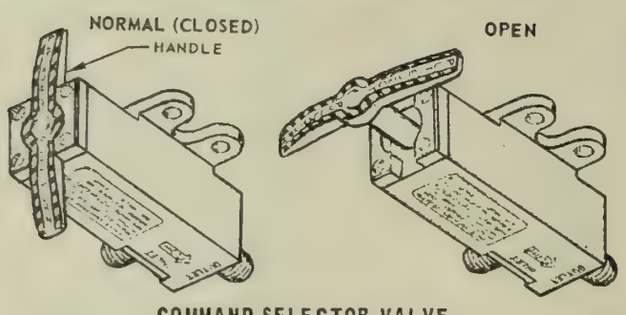
REX RILEY *Transient Services Awara*

LORING AFB	Limestone, Me.
McCLELLAN AFB	Sacramento, Calif.
MAXWELL AFB	Montgomery, Ala.
HAMILTON AFB	Ignacio, Calif.
SCOTT AFB	Belleville, Ill.
RAMEY AFB	Puerto Rico
McCHORD AFB	Tacoma, Wash.
MYRTLE BEACH AFB	Myrtle Beach, S.C.
EGLIN AFB	Valparaiso, Fla.
FORBES AFB	Topeka, Kans.
MATHER AFB	Sacramento, Calif.
LAJES FIELD	Azores
SHEPPARD AFB	Wichita Falls, Tex.
MARCH AFB	Riverside, Calif.
GRISSOM AFB	Peru, Ind.
CANNON AFB	Clovis, N.M.
LUKE AFB	Phoenix, Ariz.
RANDOLPH AFB	San Antonio, Tex.
ROBINS AFB	Warner Robins, Ga.
TINKER AFB	Oklahoma City, Okla.
HILL AFB	Ogden, Utah
YOKOTA AB	Japan
SEYMOUR JOHNSON AFB	Goldsboro, N.C.
ENGLAND AFB	Alexandria, La.
KADENA AB	Okinawa
ELMENDORF AFB	Alaska
PETERSON FIELD	Colorado Springs, Colo
RAMSTEIN AB	Germany
SHAW AFB	Sumter, S.C.
LITTLE ROCK AFB	Jacksonville, Ark.
TORREJON AB	Spain
TYNDALL AFB	Panama City, Fla.
OFFUTT AFB	Omaha, Nebr.
McCONNELL AFB	Wichita, Kans.
NORTON AFB	San Bernardino, Calif.
BARKSDALE AFB	Shreveport, La.
KIRTLAND AFB	Albuquerque, N.M.
BUCKLEY ANG BASE	Aurora, Colo.
RICHARDS-GEBAUR AFB	Grandview, Mo.
RAF MILDENHALL	U.K.

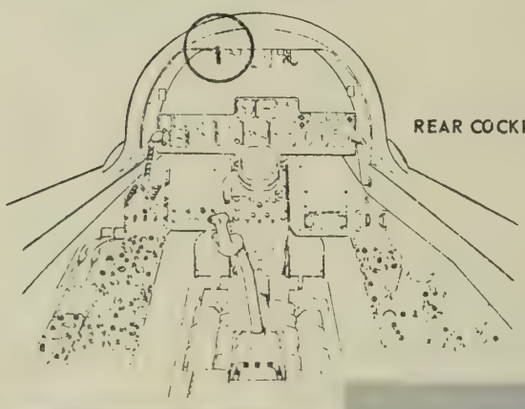
MAJ CHARLES A. LEHMAN
Directorate of Aerospace Safety

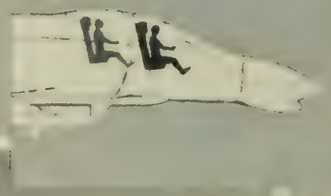


all the shiny switches



COMMAND SELECTOR VALVE







"Just turn on all the shiny switches, light the fire and go!" That old adage won't sell these days, but it's still a fact that most of the cockpit switches and controls we use regularly in flight take on a paintless glint from constant handling.

Switchology rarely starts much of an argument at the bar. But the mention of one little handle in the F-4 can gin up a pretty heated discussion. The Command Selector Valve (CSV) isn't a switch, but it acts like one, and having it closed at the wrong time can bust your butt as fast as a midair. That little handle can also save your bacon when nothing else can. Anything capable of doing that is worthy of some careful thought.

THE CSV was installed along with the H-7 seats to give both F-4 drivers a better shot at a safe ejection. With the H-7 system, either crew-

member can empty the airplane in an emergency. If the ejection is initiated from the front, both seats will go. That's true regardless of the position of the CSV. With the CSV handle closed, if the back seater pulls the ejection handle, only his seat will go. When the CSV is pulled out (open) either seat can initiate the sequenced ejection. Something that simple shouldn't cause any controversy, but it does.

So let's take a look at use of the CSV from the front seater's point of view. "I don't want to get punched out at the wrong time because my GIB misinterprets the situation." That's a common gripe, and it's not without foundation. There are cases on record where a back seater misjudged a flight condition, or the seriousness of combat damage, and left a flyable bird. Those F-4s got home without further problems. If the command selector valve had been open we would have lost the aircraft.

ON THE OTHER SIDE OF THE COIN, we've had accidents and combat losses where the back seater ejected in time, but the pilot was so busy fighting to save the aircraft that he was still in it when it made a smoking hole in the ground. Sometimes he did eject at the last instant, but not soon enough to let the system work. In other words, if the CSV had *always* been open we'd have lost some F-4s as a result of backseaters leaving too soon—but we'd have saved some front seaters.

If you decide to have the back seater open the valve for certain phases of flight, and then get into a tight situation, he can punch you both out on your command while you keep flying the airplane.

He's got more time than you have to watch things like unwinding altimeters, burning wings, or instruments. He's also got a better chance to pull the ejection handle at the right time. That's why back seaters sometimes get out safely in low altitude ejections when front seat pilots don't.

But what if he pulls the handle at the wrong time? That's where trust comes in. More about that later. First, let's take a look at the situation from the other cockpit.

SUPPOSE YOU'RE THE BACK SEATER. How does the CSV affect you? It doesn't. Whether you've got the valve open or closed, when you pull the ejection handle you go—right then! If the valve was open, the front seater will be three-fourths of a second behind you. If the valve was closed, he's on his own. As far as your own ejection is concerned, the CSV has no effect.

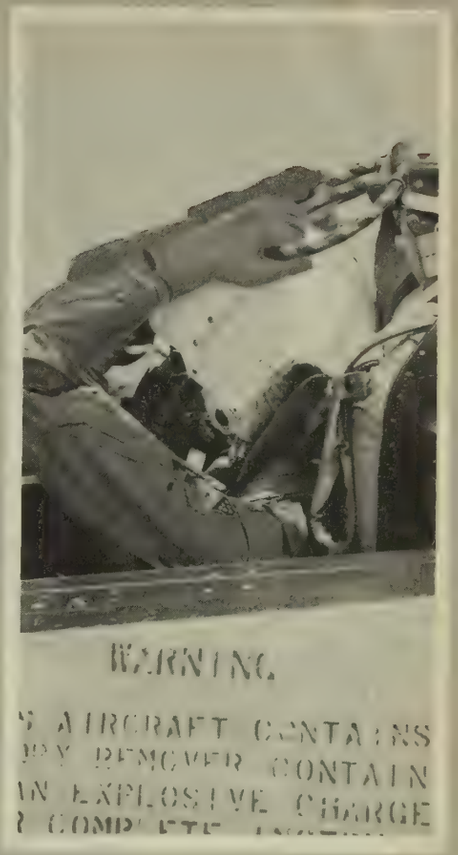
But, if you always fly with the valve open and then goof by going for your ejection handle at the wrong time, you "jettison" the airplane.

That costs Uncle Sam several million bucks and will probably cost you almost that much buying drinks to calm down your pilot.

Well, that's the situation from both viewpoints. Since there's no firm guidance on the use of the CSV in the dash one, it really boils down to a matter of crew coordination and trust. An open CSV can be a good thing or a very bad one. So when should it be open?

It all depends. The mission, the people involved, and even the stage of the mission all make a big difference. For example, an experienced IP riding in back with a brand new student up front flying the aircraft will probably make a different decision than he would if he were in the front with the student in back. Also, when you're cruising along at FL 300, the situation isn't quite the same as on takeoff.

The important thing is to know what the valve can do *for* you—and what it can do *to* you. Then weigh these against the risk for each mission or part of the mission, based on your knowledge of the other crew member. Remember though, the valve is worthless if you wait to open it until you really need it.



THERE ARE CIRCUMSTANCES WHEN HAVING the CSV open gives both of you the very best chance of coming home with a good war story when your bird won't get you there. When you're the aircraft commander you can best determine this for the conditions at hand. Before you strap in, brief the back seater on exactly what you want. If he's new or you've never flown with him before, you may not want him to touch the CSV. Fine. Just brief him—and then remember, don't wait too long if something drastic happens to the aircraft.

The Command Selector Valve is there to save lives. Don't be afraid to use it when the situation warrants. Maybe if the CSV attains just the right amount of "shine" we'll save a few pilots. ★

YOUR NEW AIMS ALTIMETRY SYSTEM

MAJ JAMES G. RIDER and
CAPT LLOYD A. EDWARDS,
6510th Test Wing, AFFTC, Edwards AFB, California

What is happening to the old tried-and-true air speed and altitude indicating systems we have used for so long on our USAF aircraft? They are being changed—that's what. Well, if they were tried and true, you ask, why change them? The reason is relatively simple, yet the explanation is not.

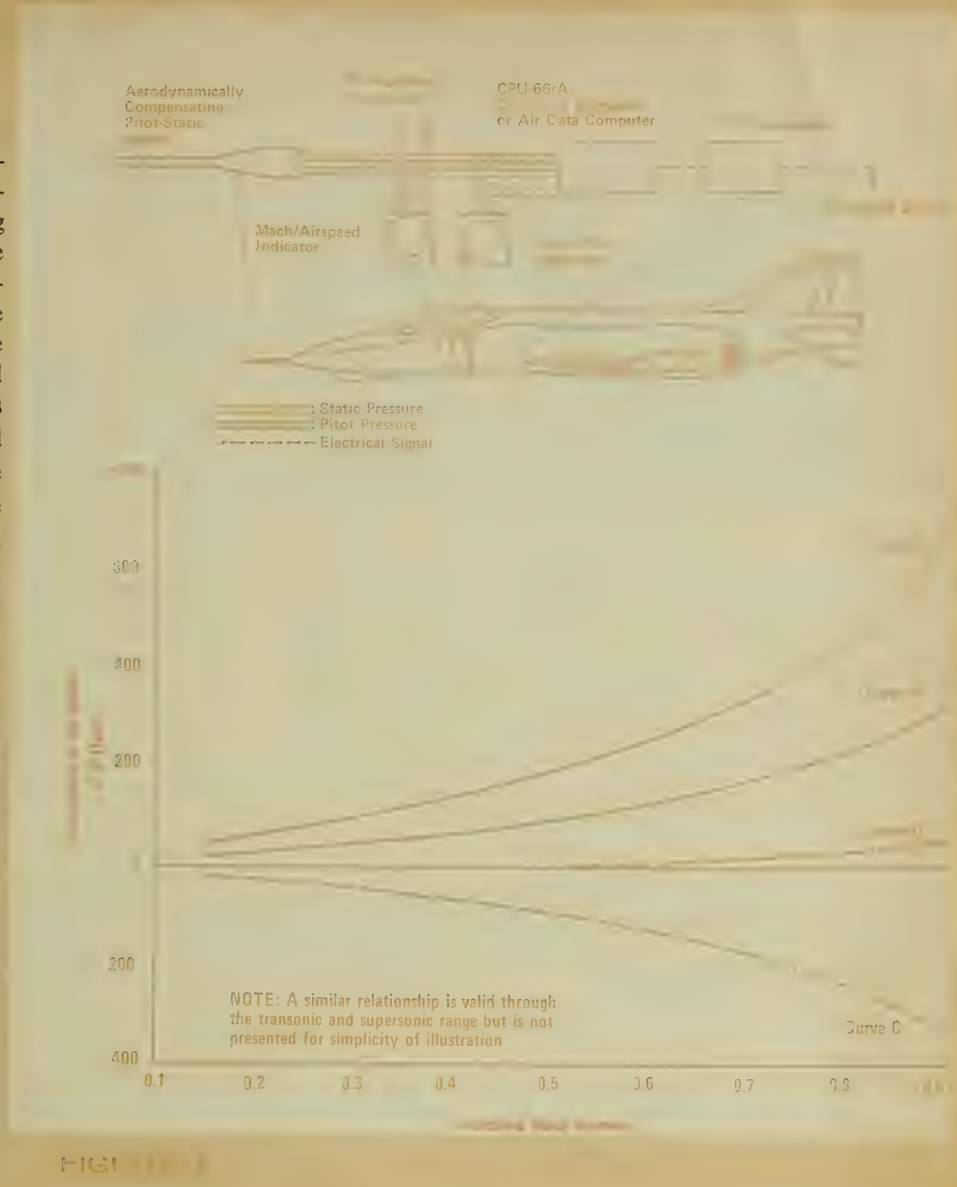
What is AIMS, what will it do for you, and what must you, the aircrew member and maintenance man, do for it? This article is written to answer these questions and give the users a better insight into the equipment capability, limitations and idiosyncrasies.

AIMS is an acronym which stands for Air Traffic Control Radar Beacon System (ATCRBS); Identification Friend or Foe (IFF); Mark XII Identification System; and S for System which reflects the many diverse AIMS configurations. The tie between all of this and your new airspeed and altitude system is in the ATCRBS.

In 1961, at the direction of the President of the United States, the FAA initiated Project Beacon to study the requirements for future Air Traffic Control (ATC) systems. One recommendation of this study was the operational use of the ATCRBS for providing positive control of aircraft in the nation's airspace. The ATCRBS requires that each aircraft being operated in the positive control area be equipped with a transponder capable of transmitting signals to a ground station for radar reinforcement, aircraft identity, and aircraft pressure altitude. Under this system, where a coded altitude response is transmitted each time the IFF is interrogated, it is essential that the aircraft, in fact, be at the reported altitude within prescribed accuracy limits. The required accuracy limits can be defined by establishing a desired vertical separation. With the ever-increasing air traffic density at the higher altitudes, it appears that aircraft vertical separation will be decreased from 2000 to 1000 feet above flight level 290. Using a nominal 1000-foot vertical separation as a basis, a study conducted in 1966 determined that the maximum acceptable altimetry system error (the difference between the altimeter display and the actual pressure altitude of the aircraft) to insure safe vertical separation was ±250 feet. That accuracy requirement was placed on the altimetry systems of all AIMS equipped aircraft within the AIMS mission portion of the aircraft operating envelope.

We all know that most aircraft have large altitude errors, many in excess of ±250 feet, particularly at high altitudes and high airspeeds. For years we have flown at the proper enroute altitude by applying a correction factor to the altimeter reading based on altitude and airspeed (or Mach number). This error, technically referred to as position error, is caused by pressures registered at the static source being different from the free stream static (ambient) pressure. This difference is a result of: (A) The existence of other than free stream pressures at the pressure source, and (B) Error in the local pressure at the source caused by pressure sensors.

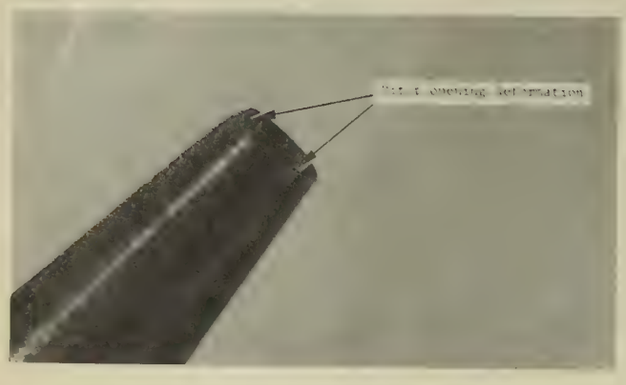
In order to achieve the accuracy and standardization requirements imposed on the AIMS systems, it was necessary to design and install new pitot-static systems on most aircraft. With many of these new systems, errors in indicated altitude have been progressively reduced through the use of aerodynamically-compensating pitot-static probes and a computer. This error reduction is illustrated in Figure 1. Curve A represents a typical pitot-static system calibration for an aircraft using an uncompensated pitot-static probe. Installation of an aerodynamically-compensating pitot-static probe on the same aircraft will reduce the position error to some level as depicted by curve B. Pitot and static pressures are provided to an altitude encoding computer or an existing Air Data Computer which is designed to apply a correction as shown by curve C. The correction is equal in magnitude but opposite in sign from curve B. The resulting output from the computer provides altitude information corrected for position error.



The synchro altitude data is supplied to a servoed altimeter (AAU-19/A in RESET mode) providing the pilot with a corrected altitude indication, and digital output is supplied to the IFF transponder for the altitude reporting function. The error in indicated altitude should theoretically be zero but seldom is due to calibration accuracy and equipment design tolerances. The error must, however, be within the ±250-foot tolerance. A typical AIMS indicating system calibration is shown by curve D. In case of a system failure in the altimeter or computer the altimeter will automatically revert to a STANDBY mode of operation. In the STANDBY mode, the computer correction is no longer applied and the altimeter receives static pressure directly from the pitot-static system and operates as a standard pressure altimeter. As such, an altitude position error correction, corresponding to curve B of Figure 1, must be applied by the pilot to insure that the aircraft is at the proper assigned altitude. The Mode C altitude reporting function remains operable with the altimetry system in the STANDBY mode, providing the STANDBY mode was manually selected by the crewmember or was the result of a servo failure in the altimeter. In case of a computer failure, a failure monitor relay de-energizes, disabling the digital output circuit and preventing transmission of Mode C information. Mode C capability can be checked by the use of the Mode C test feature.

Some aircraft, primarily the low speed, low altitude types, have small enough position error that a computer-applied correction is not necessary to achieve the AIMS accuracy requirements. Some of these aircraft retained their original pitot-static systems, while others are equipped with new aerodynamically-compensating probes. In either case the aircraft is equipped with an AAU-21/A Altitude Encoder/Pressure Altimeter rather than the AAU-19/A altimeter and altitude encoding computer as previously discussed. The AAU-21/A is a self-contained unit consisting of a standard pressure altimeter to display pressure altitude, combined with an altitude encoder that transmits pressure altitude signals to the IFF transponder to provide the altitude reporting function. The AAU-21/A altimeter receives static pressure directly from the aircraft pitot-static system and, although small, errors in indicated altitude do exist. The pilot should be aware of the exact correction required for his particular aircraft and apply that correction to insure the aircraft is at the proper assigned altitude.

Now, let's turn from altimetry to airspeed. Since an airspeed indicator receives both pitot and static pressure inputs, incorrect measurement of static pressure causes an error in indicated airspeed as well as altitude. As was previously discussed, the error in indicated altitude has been significantly reduced through corrections applied by a computer. These corrections, however, are made to altitude only, and NOT to indicated airspeed or Mach number. Errors in indicated airspeed and Mach number still exist and are proportional to the



YOUR NEW AIMS ALTIMETRY SYSTEM CONTINUED

static pressure error (curve B of Figure 1) for the particular aircraft. With the advent of aerodynamically-compensating pitot-static probes, often located in new positions on the aircraft, the position error is usually less than before; but, the big point to be made here is the corrections to be made to indicated airspeed are now DIFFERENT and require the pilot to know how these changes affect his particular aircraft.

Let's take a typical example. The F-102A Flight Manual has pattern speeds published in terms of indicated airspeed. The way this speed is determined is given by the relationship:

$$V_i = V_c - \Delta V_{ic} - \Delta V_{pc}$$

Where:

V_c = calibrated airspeed (essentially equal to true airspeed at traffic pattern altitude and airspeed, and corresponds to the speed the aircraft responds to).

V_i = indicated airspeed not corrected for airspeed indicator instrument error.

ΔV_{ic} = airspeed indicator instrument correction (assumed equal to zero for this analysis).

ΔV_{pc} = airspeed position error correction

The "book" says fly final at 170 knots minimum and touch down at 130 knots minimum. These speeds are before AIMS. The performance section shows that ΔV_{pc} is about 6 knots.

Therefore:

$V_i = V_c - \Delta V_{ic} - \Delta V_{pc}$
$= 170 - 0 - 6$
$= 176$ for final
or 136 for touchdown

After the AIMS pitot-static system was installed, the airspeed correction became essentially zero. Now to fly the same calibrated airspeeds of 176 knots for final approach and 136 knots for touchdown,

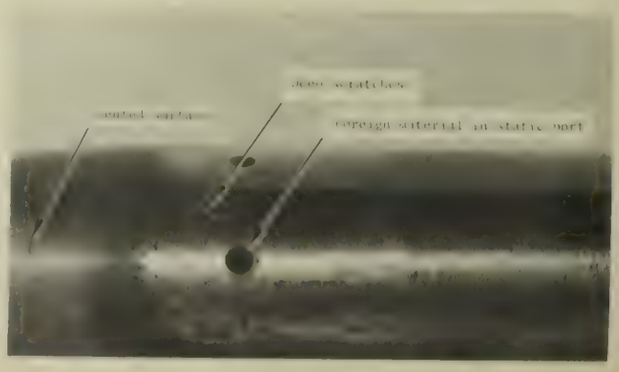
$V_i = V_c - \Delta V_{ic} - \Delta V_{pc}$
$= 176 - 0 - 0$
$= 176$ knots for final approach
or 136 knots for touchdown.

It is necessary to hold an additional six knots (in terms of indicated airspeed) above what was previously published in the Flight Manual and what has been used by the pilots for many years. It is easy to see what could happen if the old speeds were used for a minimum run approach.

All AIMS modified aircraft are not as extreme as the example just given, while some may be worse. *The point is* that the pilot must be made aware that changes have been made, he must be provided with the proper information to make the required adjustments, and, most important, HE MUST USE IT.

Another Major Factor—**Maintenance**

The exterior surface of the new aerodynamically-compensated pitot-static probes is a precision machined surface and is considerably more vulnerable to damage than previous probes. To maintain AIMS accuracy requirements it is essential that the probe surface be kept free of bends, dents or scratches. The static ports and pitot opening must be clean and not burred on the edges. The slightest deformation of the pitot inlet can cause disturbed flow over the static ports and result in large airspeed and altitude errors. The accompanying photographs are of a pitot-static probe installed on an F-104 aircraft as it was received at the AFFTC for AIMS flight testing. The probe had obviously been in service for a long time and had been considered satisfactory for operational use. On the ferry flight to the AFFTC the pitot-static system appeared to operate normally. As part of a normal ground inspection prior to flight testing the damaged probe was identified, removed, and sent to the manufacturer for inspection and tests in a wind tunnel. The damage had produced an approximate 3-knot error in airspeed at approach speeds. Perhaps that would constitute only a minor flight hazard, but had the damaged areas been oriented



slightly differently, the effect on static pressure error could have been significantly greater, creating a serious flight hazard.

There are a few models of pitot-static probes which will fit different aircraft, such as the F-102A, TF-102A, and F-106. Visual determination of which probe should be installed on which aircraft is impossible without reference to the probe model number. Each model probe has been specifically designed for a particular aircraft and provides a level of compensation unique to that aircraft. If installed on another model aircraft, the indicated airspeed and altitude will be erroneous.

In addition to these problems, the pitot-static probe location has been changed on many aircraft. It seems that the new location is where ladders, maintenance stands and such have always been placed. Breaking old habits is hard, but every time a ladder bumps one of these probes, the probe will have to be changed.

This article has not addressed the operation of the associated electronics that are being installed along with the pitot-static and altimetry systems. These instructions should be forthcoming in revisions to the various Flight Manuals and are in general quite straightforward.

Be sure before you fly that you have the proper position error curves and have recomputed such things as final approach, landing, and stall speeds based on this proper data. Also insure the surface and ports on the pitot-static probe are clean and undamaged. Be especially sure when replacing a pitot-static probe that exactly the right part is used, and be careful of your ladders, stands, and armament loaders. With the proper care and understanding on the part of all crewmembers (ground and air), the new AIMS equipment should serve you well and provide more accurate information than has heretofore been available in most aircraft. ★

NO TIME FOR DREAMING

I've read articles about air collisions, vehicle collisions, and even people collisions. But I don't recall seeing any about the kind of thing that nearly happened to me. I'm talking about collisions between vehicles and planes.

My "hairy" episode happened when I was a half-ton truck driver. Occasionally, my driving would take me down to the base's northern edge, where two units of Reserve aircraft were assigned. One unit flew C-124s and the other KC-97 tankers. Besides marveling at how tall those old-timers were, I was surprised at how quietly they taxied . . . and thereby hangs my story.

On a hot, sultry summer day, I was sent to check the status of a weapons upload in progress on the flight line. The loading crew's truck radio had gone SNAFU the previous day. It was routine, so I hopped into the blue Ford "half-tonner," and drove off towards the flight line. Since it was late on a Friday, line traffic was pretty light.

Per the safety rules, I drove parallel to the flight line until I was close to a B-52 that was my destination. After checking *vehicle* traffic, I made a turn to the left, and started across the ramp . . .

I was daydreaming about two whole days away from work, and paying attention to my driving was about the last thing on my mind. Providence, or whatever God-given agency watches out for damnfool drivers, suddenly blinded my eyes with bright sunlight, like that being reflected off the fuselage of a well-kept old Kay-Cee-Niner-Seven! I looked up and around in time to see that big, noble nose towering above my little Ford. It looked like the Jolly Green Giant's personal plane.

After letting a few words of surprise (which can't be printed), I snapped the pickup's steering wheel into a hard left turn and scurried out of the way. After checking the amount of room, I made another right turn and hastily scampered over next to the B-52s and let old Noble-Nose make her ponderous way past. In my state of mind, I could almost hear those big radials muttering: "Next time . . . next time . . . next time . . .", and the huge fans whirling out there on their shafts looked for all the world like rotary guillotines, ready to whack up a dumb airman and his pickup.

I now have a different AFSC and work in a quiet office job where I don't need a military driver's license. On occasion, though, I bum a ride out to the flight line. Never far from my mind is the time I almost bought it, due to a few moments of stupidity.

Recips don't land at my present base too often, but when they do I see that one thing hasn't changed—prop jobs are still stealthy taxiers. The not-so-alert driver buzzing around out there still risks meeting one, but not in the manner he anticipated. It almost happened to me. I hope it doesn't happen to you. ★

OPS TOPICS

a snag in the fabric

Events which test the fabric of a system frequently come to us when we least expect them. Witness the following:

A U.S. Navy aircraft, with a company test pilot at the controls, was on a ferry flight to a delivery point. On rollout at destination, the pilot discovered that his left brake was inoperative. He elected to add power and convert his full-stop landing into a touch and go.

Airborne, he contacted a nearby USAF base (with lots more runway and better crash equipment) and described his situation, saying he would like to make a touch and go landing and try his brakes with the anti-skid system off. Tower cleared him touch and go, and the pilot determined that his left brake was still inoperative.

The pilot then asked that the MA1A barrier be removed, and tower replied that it would be removed ASAP. The tower immediately called and asked the crash/rescue unit to determine the position of the MA1A—whether it was up or down. The crash unit was in front of the tower and required two-three minutes to travel to the end of the runway.

Two minutes after the first request, Tower cleared Rescue to the barrier "without delay," and instructed them to "Get that MA1A off." Rescue acknowledged.

Two more minutes were eaten up when parts started falling from the aircraft (heat stacks from the brakes). Despite several transmissions back and forth between Tower and Rescue, no one checked for the fallen objects.

By now, some eight minutes after initial request, the pilot was getting a "little low" on fuel, and decided that he'd better go ahead and try to make a BAK-9 approach-end engagement.

On his first try the pilot, trying to miss the MA1A, also missed the BAK-9. He made a short pattern, this time picking up the MA1A, but again missed the BAK-9. He carried the MA1A around the pattern with him and, on his third try, successfully engaged the BAK-9. The MA1A cable and "J" hooks destroyed three strobe lights and nine approach lights and damaged the BAK-9 cable.

Well, now—what in the world was the problem? Turns out that Tower had received an Operations letter from the Base Commander stating that, when a BAK-9 engagement became necessary, the MA1A would be removed. Crash/Rescue never received the letter (they were not an addressee), and were still following a MAJCOM supplement to AFR 55-42 which states that the barrier will be lowered, not removed.

Another possible lesson to be learned here concerns the importance of timely accurate communications. Tower assumed that Rescue knew what Tower wanted, and didn't go into much detail in giving directions. Tower also was not aware of the fuel status of the aircraft—until the pilot mentioned his low fuel state—so there wasn't much urgency in the initial actions.

This base has now patched up the fabric of its communications, hopefully. But there sure oughta be an easier way!

we try harder

(TO GET IN TROUBLE)

The mission was an instrument checkride in the T-39, and everything was ops normal until the first instrument approach at an outlying airfield. During the approach, the Nr 2 engine fuel heat light flickered on, but the system was checked and the malfunction was considered a no-abort item.

On the next approach, the Nr 2 engine EGT gage started fluctuating. RPM, fuel pressure and oil pressure were all normal—the "only" indications of problems were fluctuating EGT and a flickering fuel heat light!

The flight was continued, and on the *fourth* approach, after touch and go, the Nr 2 engine oil pressure fluctuated between 35 and 45 psi, then dropped below 35. The Nr 2 engine was shut down and a single engine recovery made at home station. An obvious vibration and a grinding noise were noted as the engine decelerated!

Two second-stage turbine nozzle vanes had failed and shifted aft, contacting the second-stage turbine wheel. The turbine wheel had one bucket broken and missing and had suffered considerable damage to the remaining buckets. Inflight disintegration of the buckets had made three small holes in the turbine exhaust case, and damaged the EGT cannon plug and the PT5 sensing line. Oil pressure loss was probably caused by

vibration from the second-stage turbine wheel causing Nr 3 carbon seal failure.

Although flight manual procedures permit continued flight with the fuel heater caution light on, additional abnormal engine indications should suggest reduced power or engine shutdown depending on flight conditions. To disregard such warning signs is to invite trouble. Luckily another inflight emergency ends up as a routine incident report, and for that we're grateful.

readback feedback

The ink was barely dry on the July issue when a controller from the North called to chastise us about the "FLIP Change" that deleted the requirement to readback ATC clearances.

"Maybe that's true where you guys are," he said, "but tain't so here in Canada!"

He's right, of course. That particular FLIP change applies only in the United States (including Alaska and Hawaii). Elsewhere, do as the Romans do.

aero clubs & supervision

When the Aero Club bird returned from cross-country, the club's fuel tank was empty. The pilot measured fuel remaining in the airplane as eight gallons in the left wing, nine gallons in the right wing, and noted on the time sheet that the aircraft had not been refueled.

New day. New instructor. New student. The instructor didn't bother to check the maintenance status of the airplane, nor did he bother to supervise the student's preflight—even though it was to be the student's initial flight in that model aircraft!

As it turned out, one of the write-ups in the 781A—which no one bothered to check—concerned the left fuel tank gage: it was stuck on the "full" mark. And as it turned out, the unsupervised student, even though he was observed carrying a checklist, failed to discover the true fuel status of the left tank.

Surely nothing set up so well could fail to occur! The student and his instructor used normal fuel management procedures for a full left tank—and of course they ran the tank dry. Unfortunately, the bird was about 50 feet in the air on takeoff when the engine quit, and there was no time to switch tanks and get a restart.

The result: minor injuries to the crew; major damage to the airplane; and a black mark against Aero Clubs all over the world.

flip changes

Worldwide Realignment of DOD FLIP Areas of Responsibility: The Africa and Southwest Asia (ASWA) DOD FLIP Enroute Charts 9 and 10, plus associated terminal areas, Enroute Supplement and Planning Data and Instrument Approach Procedures were transferred to the Pacific and Southeast Asia (PSEA) FLIPs. The following ASWA FLIP issues were the last to contain Aeronautical Information for the area covered by ASWA Enroute for the area covered by ASWA Enroute Charts 9 and 10:

DOD EASWA FLIP Planning Section II-B dated 17 June 1972

DOD EASWA FLIP Planning Section II dated 25 July 1972

DOD ASWA FLIP Enroute Supplement & Charts dated 16 August 1972

DOD ASWA FLIP Terminal Procedures dated 17 August 1972

DOD FLIP users are requested to submit aeronautical information changes, additions, and deletions for this area to Defense Mapping Agency Aerospace Center, Flight Information Office-Pacific, APO San Francisco 96553, Telephone 44-2100, AV 3310111. Message: DMAAC FIOP, Hickam AFB, Hawaii. Requirements for user quantities should be forwarded well in advance IAW DOD Catalog of Aeronautical Charts and Flight Information Publications.

The following PSEA FLIP issues were the first to contain aeronautical information for the area previously covered by ASWA Enroute Charts 9 and 10:

DOD PAA FLIP Planning Section II-B dated 17 August 1972

DOD PAA FLIP Planning Section II dated 14 September 1972

DOD PSEA FLIP Enroute Supplement and Charts dated 14 September 1972

DOD PSEA FLIP Terminal Procedures dated 14 September 1972.

engine failure (?)

As the aircraft rolled wings level on downwind, the IP saw that the left engine RPM had gone to zero. Quick as a flash, he shut down number one!

After a successful airstart, and a more deliberate examination of the engine instruments, he realized that all indications were normal—except those of the tachometer, which read zero.

Diagnosis confirmed: failure of the left tach generator.

taxi crunch

The pilot of the B-52 thought he could clear the fire truck parked by the side of the taxiway. Guess what?

using your staff

The boss of any organization, if he's successful, has a staff to advise him, point out errors and make recommendations.

This is equally true in the front office of an airplane, and it doesn't make a lot of difference whether the "staff" occupies the right seat or the rear seat. He has a lot to contribute.

Maybe we should steal a page from the operations manual of a major airline:

"First Officers are charged with the responsibility to inform the Captain immediately and at any time, should they believe an aircraft is being handled improperly or placed in jeopardy. The Captain may choose to disregard a First Officer's counsel, such is his command privilege, but no matter to what degree or how often a First Officer's advice to his Captain may be disregarded or ignored, he nevertheless will be held responsible for always offering such advice."

There are numerous recent incidents in which the importance of staff backup was extremely evident. The books also show where the absence of an alert backup has been a contributing factor in many accidents.

The final judgment belongs to the aircraft commander. But the A/C who refuses to consider, or who discourages, advice from the other chair is passing up a lot of free insurance.

(FLIGHT SAFETY FOUNDATION)

flip changes

Goldstone Deep Space Communications Antenna—NASA and the Jet Propulsion Laboratory operate an extremely powerful deep space communications facility at Goldstone, California, coordinates 35° 25.5'N 116°53'W. The transmitted power from the facility creates a hazard to all aircraft and must be avoided by at least 5 NM. Aircraft equipped with electro-explosive devices (EEDS) should avoid the facility by 19 NM. However, Goldstone transmits in only one 20-degree sector at a time. It is this sector in which a hazard exists between 5 NM and 19 NM for EED equipped aircraft. Therefore, EED equipped aircraft requiring transit closer than 19 NM should contact Edwards Approach Control to determine the 20-degree sector being used by Goldstone at the time. EED equipped aircraft may fly as close as 5 NM outside the 20-degree sector in use.

bold face Practice

On takeoff roll, at about 130 knots, the fire light lit. Cause: a heat duct assembly failed, allowing 16th stage air into the engine compartment. The pilot pulled throttles to OFF and dropped the tailhook, but too late to snag the midfield barrier. There was no end barrier in place. The Board concluded that there was sufficient runway to stop, even without the barrier. This F-100 didn't stop in time, primarily because the pilot forgot to deploy his drag chute. Drag chute deployment is a bold face item in the abort checklist.

Obviously, training was deficient. If training had been adequate, the pilot wouldn't have forgotten. Rote memorization of BF items is a great help, but if each step doesn't conjure up a corresponding ACT on the part of the pilot, it is only partially effective. Because of this, emergency procedures are best practiced in a simulator or procedures trainer, where dials can be twisted, switches thrown and knobs and levers pulled. During EP training, nothing less than 100 percent is an acceptable goal. ★

Surveillance Radar Approach



Like bridge, the surveillance radar approach is a partnership game. It's interesting, sometimes, to take a look at the rules that are laid down for the other half of the partnership. The following information is taken from Federal Aviation Regulations governing Air Traffic Controllers. (Italics are ours.)

HOT DOPE SHEET
2nd Marine Acft Wing

Approach Information

• Before starting the final approach, inform the aircraft of the runway to which the approach will be made.

• Provide recommended altitudes on final approach *if the pilot requests. If so requested,* inform the aircraft that recommended altitudes will be given each mile on final approach down to the last mile which is at or above the published MDA.

Descent Notification

• Issue advance notice of where descent will begin and issue the straight-in minimum altitude/MDA prior to issuing final descent for straight-in approaches. *If requested by the pilot,* issue the circling minimum altitude/MDA.

• Recommended altitudes are determined locally using the following criteria added to the field elevation.

6 miles—1800 feet
5 miles—1500 feet
4 miles—1200 feet
3 miles—900 feet
2 miles—600 feet
1 mile—300 feet or MDA, whichever is higher

Descent Instructions

• When an aircraft reaches the descent point (where descent is authorized) issue clearance to descend to MDA unless a descent restriction exists. If a restriction is necessary, specify the restriction altitude. When the aircraft passes the altitude limiting point, advise it to continue descent to MDA.

Approach Course Guidance

• Issue course guidance and inform the pilot of the distance each mile from the landing threshold or from the airport while the aircraft is on final approach. Recommended altitudes shall be furnished *if requested.*

• Issue trend information as required, to indicate target position with respect to the extended runway centerline and to describe target movement as appropriate corrections are issued.

Approach Guidance Termination

• When IFR conditions exist at the airport, instruct the aircraft to report sighting the runway, approach/runway lights, or airport as appropriate.

• Surveilance approach guidance may be discontinued and the pilot instructed to take over visually, if he so requests or, when under IFR conditions, the pilot reports the runway, approach lights or airport in sight. Under VFR conditions the approach guidance may be discontinued if the aircraft is at the missed approach point (MAP) or one mile from the landing threshold, whichever is greater.

• Discontinue approach guidance and instruct the pilot to execute a missed approach if runway or approach/runway lights have not been sighted when the aircraft is at the missed approach point (MAP) or one mile from the landing threshold, whichever is greater. ★



IS THE AIRCRAFT *REALLY* READY FOR FLIGHT?

Adapted from the article, "Up or Down," by LCDR J. R. HILL, APPROACH, May 1969.

Mechanical, electrical and hydraulic equipment—unlike the human body—have no recuperative power. Therefore, when an equipment malfunction occurs, we must correct the discrepancy. If we do not, the trouble will persist and more than likely worsen.

This is why we must be very suspicious of the phrase, "Ground Checks OK," when it is used to write off an aircraft discrepancy. The truth is, if a discrepancy really existed in the first place, there is a 99 percent chance that it still exists, notwithstanding the fact that the equipment "ground checks OK." In most cases, it would be more forthright to state simply that, "The trouble cannot be identified because the discrepancy cannot be duplicated on the ground."

If the problem cannot be identified, what can be done? Or more correctly, what should be done? The very first thing is for all concerned to recognize that the aircraft has an *uncorrected discrepancy*. Then, attention can be directed to determining what action must be taken.

An attempt should be made to correct the problem, of course. This entails troubleshooting. It's relatively simple to troubleshoot most discrepancies but maddening to troubleshoot some. If a light bulb fails to illuminate when the switch is turned on, troubleshooting procedures would include replacing the bulb. If the light then illuminated, the troubleshooter would be justified in believing he had corrected the discrepancy.

On the other hand, the troubleshooter must be leery of some trouble shooting procedures. Sometimes a pilot will gripe about a piece of equipment but it ground checks OK. Maintenance personnel—not satisfied to write the matter off as "ground checks OK"—may also replace the component involved. This shows concern and interest but it does not prove very much. That is, if the old component ground checked OK, it is a foregone conclusion that the new component will also. Therefore, unless logical and *tested* troubleshooting procedures are used, and the mech *knows* he has isolated and corrected the problem, he should plainly say so in the writeoff. He should indicate that the corrective action taken was speculative in nature and that further checks are necessary to determine whether the problem has been corrected.

Many checks of this nature can be made in the course of the next scheduled flight but some cannot, or at least should not. It depends primarily upon the nature of the discrepancy, but consideration should also be given to the persistency of the problem.

It therefore, becomes part of the larger question of whether the aircraft is up, up for test, or down.

COMING UP WITH THE CORRECT ANSWER

Most of the time the answer is simple and clearcut: an aircraft has a discrepancy which causes grounding. In this connection we have a large body of established criteria regarding the airworthiness of aircraft. It is the result of our best efforts in the area of design, engineering, manufacturing—and operational experience. Much of the criteria leaves little room for misinterpretation, e.g., when an aircraft engine has X number of operating hours, it must be overhauled.

Other criteria are less positively established. Nevertheless, it is usually sufficient to provide effective guidance to knowledgeable maintenance and operating personnel. What then is the problem?

First, as we have already indicated, the existence of the problem may not be adequately recognized or, if it is, the solution is not apparent. Moreover, at times there is an honest difference of opinion as to the weight which ought to be accorded specific discrepancies. Finally, we often have to take operational commitments into consideration.

RECOGNIZING THE PROBLEM

There are many individuals who tend to hedge when it comes to measuring the aircraft against the established criteria. The pilot who

circles the *up* arrow on the yellow sheet (Navy terminology) and then writes: "For pilot info: slightly dragging left brake," may be performing a correct and highly desirable function . . . keeping everyone informed of the condition of the aircraft . . . or, he may be merely passing the buck via a "good guy's" write-up. In any event, the pilot is probably in the best position in this case to assess the extent of the problem. But if he defaults in this duty, who will pick up the ball and run?

The point is, the impact of what often should be a blunt and forthright statement, i.e., "The aircraft is *down*—left brake drags," is hedged at times by a pilot info note. We ought to mention, too, certain adjectives which are frequently found on yellow sheets: "Small, minor, insignificant," etc. We don't say such words should not be used; they often *must* be used to indicate more exactly the degree of the problem. However, many of these words have a permissive implication and are sometimes employed for just that reason.

Most aircraft systems include gages, dials and indicators of one type or another which, if not ignored, will give some good indications of system malfunctions. Be that as it may, assessing the condition of an aircraft system often requires an expert knowledge of mechanics, superior airborne judgment, and the moral courage to tell it like it is—on the yellow sheet.

If a pilot does not possess the requisite mechanical knowledge—and many don't (considering the complexity of today's aircraft)—it is incumbent upon the pilot to consult with experienced maintenance personnel in order to ensure an effective writeup. Maintenance personnel also have an equal responsibility to report aircraft discrepancies, whether it be an aircraft commander who notes a questionable condition on a daily preflight, an experienced mech who notes a problem during a periodic check, or a line midwatch who spots fluid leaking from the aircraft. All have a responsibility to insure discrepancies are fully reported and documented.

To summarize, correct decisions cannot be made on the *up* or *down* status of aircraft unless positive steps are taken to adequately identify discrepancies. One area where serious problems are often overlooked is in the case of *repeat gripes.* This subject is important enough to deserve separate comment.

REPEATED GRIPES A RED FLAG

Any item repeatedly griped on the yellow sheet should serve as a red flag warning. It matters not that it is a seemingly minor discrepancy. The fact is, it could not *really* be minor if repeated efforts of the maintenance department have been ineffective in eliminating it. Therefore, whenever the remedy cannot be established for a repeat gripe, large or small, take warning—it's a good indication that there is something seriously wrong, either in the aircraft, in the maintenance or operating personnel procedures, or in the maintenance system.

In these cases the status of the aircraft should become a continuing concern at the highest levels of maintenance department supervision. This does not necessarily mean that the aircraft should be arbitrarily *downed,* but in many cases it should be until all avenues of expert investigation and assistance have been exhausted. We refer now to the expertise available from the manufacturer's representative, staff maintenance, and many other sources.

Many discrepancies are not susceptible to duplication on the ground, a fact which we have already discussed. This is sometimes a contributing factor in repeat gripes. In these cases an additional flight or flights may be necessary to more definitely identify the problem *and* the correct fix. The big hazard here is that the inflight check will be regarded as a minor requirement and will be assigned to a pilot as a routine collateral duty during the next scheduled mission. In reality, because of the persistence of the problem it should rightly be regarded as the primary reason for the next flight.

Utilizing regularly scheduled flights to make certain inflight checks for maintenance purposes is a valid procedure. It should be questioned, however, in the case of repeated gripes which have not been corrected through established maintenance procedures. It follows that if repeat gripes are properly recognized as a serious problem it is also a matter serious enough to warrant the attention of a properly qualified maintenance test pilot, accompanied by experienced maintenance personnel, when appropriate. The point is, when an aircraft or aircraft system is repeatedly griped, for the same or similar reasons, it's trying to tell us something. *We ought to listen!*

OPERATIONAL REQUIREMENTS

This is another factor which often figures into the *up* or *down* status of an aircraft. Our problem is to ensure that it is figured correctly. There are times when a pressing operational need will dictate launching an aircraft with known discrepancies when it would otherwise qualify for a *down* status. This is a perfectly valid concept; however, such decisions must be made at a responsible (and authoritative) level, based on the best information available. Such decisions should never be the mere result of default in reporting or assessing discrepancies.

From time-to-time the tempo of operations may pick up as a result of operational requirements. Almost

invariably, personnel assigned to the unit will be caught up in the spirit of the general upswing and will tend to manifest the traditional "can-do" attitude. This is fine, but it does create a potential hazard. A pilot or maintenance man, in the spirit of expediting operations, may discount or ignore seemingly minor discrepancies without subjecting them to adequate processing in the established system. Such an instance might be failure to gripe a navigation aid because the next flight will be made in VFR conditions. This can only short-circuit the decision-making process.

SOUL SEARCHING IN ORDER

The decision-making process by which we answer the question, is the aircraft *up* or *down*, is complex. We don't presume to know all the answers as to how this process should operate. It is apparent, however, that this decision-making process should be the subject of soul-searching and continuing review at the operating level. If it is to be an effective process, it must include:

- Pilots and maintenance men who tell it like it is on the yellow sheet and other aircraft records.
- Respect for established criteria. Granted, certain criteria may be subject to change depending on operational requirements. This does not mean, however, that the criteria can be ignored. Rather, it means that when operational requirements dictate less stringent criteria, it becomes all the more important that such criteria be fully respected.
- A positive approach to the identification, reporting, assessment, and correction of aircraft discrepancies, especially those of the repeat or "ground checks OK" variety.
- Recognition that honest differences of opinion do exist concerning aircraft discrepancies. In this connection, unit leadership and sound supervision should provide positive safeguards to ensure that maximum knowledge, experience and judgment are brought to bear on the problem. If this means bucking the problem all the way to the maintenance officer or aviation department head—then, so be it!

Is the aircraft *really* ready for flight? This is a question which demands the best judgment of pilots, maintenance crews and operations personnel. Overlooking, ignoring, or merely tolerating aircraft discrepancies, will not meet this demand. ★

DO US A FAVOR

The following is an occurrence related by an AFCS flight check pilot. It points out one of the reasons why control towers and other ATC facilities continue to experience radio problems:

FLIGHT CHECK 12345—"Rando Approach, your transmitter has a loud squeal. You're barely understandable, over."

APPROACH—"Flight Check 12345, Roger."

APPROACH—"AF67890 Rando Approach, how do you hear me? Over." (Squeal still present.)

AF 67890—"Approach, you're loud and clear."

APPROACH—"Roger AF67890, radar contact on departure, turn right heading 060, maintain 3000."

AF67890—"Say again, Approach, you have a loud squeal . . ."

AFCS continually evaluates air traffic control air/ground radio communications. New UHF/VHF radio equipment is being installed in control towers and radar units under the *Rivet Switch* Program. Some of the changeouts will not occur for several years and AFCS is doing all in its power to improve performance of the present equipment. We are asking everyone involved in A/G communications to do a favor for both us and themselves; make thorough radio checks.

Any radio check made with an air traffic control facility should be objective. Even though you understand the transmission, if there are noises in the background (squeals, howls and scratchy sounds), they may be an indication of radio deterioration. Unless this condition is reported, we may not detect it. Once the problem is brought to our attention, we can take action to correct it and give you the better service that you deserve. Radio checks can be performed in several ways. You can use the R-5, S-5 procedure outlined in AFM 51-37, the old 5x5 procedure, or just merely tell it like it is. ★

TOOTS is interested in your problems. She spends her time researching questions about Tech Orders and directives. Write her c/o Editor, Aerospace Safety Magazine, AFISC, Norton AFB, CA 92409.



Cooling Power of Wind on Exposed Flesh Expressed as an Equivalent Temperature
(under calm conditions)

Estimated wind speed (in mph)	Actual Thermometer reading (° F.)											
	50	40	30	20	10	0	—10	—20	—30	—40	—50	—60
	EQUIVALENT TEMPERATURE (° F.)											
calm	50	40	30	20	10	0	—10	—20	—30	—40	—50	—60
5	48	37	27	16	6	—5	—15	—26	—36	—47	—57	—68
10	40	28	16	4	—9	—21	—33	—46	—58	—70	—83	—95
15	36	22	9	—5	—18	—36	—45	—58	—72	—85	—99	—112
20	32	18	4	—10	—25	—39	—53	—67	—82	—96	—110	—124
25	30	16	0	—15	—29	—44	—59	—74	—88	—104	—118	—133
30	28	13	—2	—18	—33	—48	—63	—79	—94	—109	—125	—140
35	27	11	—4	—20	—35	—49	—67	—82	—98	—113	—129	—145
40	26	10	—6	—21	—37	—53	—69	—85	—100	—116	—132	—148
(wind speeds greater than 40 mph have little additional effect.)	LITTLE DANGER (for properly clothed person)				INCREASING DANGER			GREAT DANGER				
	Danger from freezing of exposed flesh											
	Trenchfoot and immersion foot may occur at any point on this chart.											

TOOTS

Dear Troops

Cold weather has arrived in many places, so now is the time for all of you out there to take a good look at your winter clothing. Do you have the required clothing? Is it in serviceable condition? Now's the time to check.

Each year some troops get so wrapped up in their overcoats or parkas that they walk into jet intakes and props, while others get hurt in towing and taxi accidents because of ice or snow. Some put on too many socks, and get their feet frozen because of poor blood circulation, and others get frost-bitten because they didn't know about the "chill index." (A measurement of the cooling effect of wind on exposed flesh.) Still others lose chunks of skin and flesh when they jerk their hand away after they have been frozen fast to cold, bare metal. **Boy, does that smart!** Others have been known to "burn" their lungs by running in sub-zero weather.

So, you see, it's really a good thing to be properly dressed and mentally prepared for winter. I do hope all my friends out there are well-equipped with suitable clothing for whatever winter conditions may lie ahead. In case any of you are wondering, I do have a complete wardrobe of suitable clothing (even a bikini and parka) that will see me safely through any type weather.

Toots

Dear TOOTS

QC and the flightline troops are at odds over a recent gig that a sister squadron received on an ORI. It seems they were gigged for not having warning signs posted during aircraft servicing as referenced in AFM 127-101, Para 6-3b(2). We, the flightline troops, contend that this paragraph pertains to flammable gases and not flammable fluids; therefore, the signs are not required. "Not so," says QC—what say you?

SMSgt Robert L. Schutte
302 Tac Alft Wg
Lockbourne AFB, Ohio

Dear Robert

I believe your quality control inspector types have misinterpreted AFM 127-101, paragraph 6-3b(2). This paragraph does not pertain to aircraft servicing. It pertains to the National Electric Code, article 500. Articles 500 through 503 apply to electrical equipment and wiring installations that house explosive products such as POL pump houses, hydrogen storage areas, etc.

AFM 127-101, paragraph 8-3, covers aircraft refueling, sub-paragraph 8-3(N) covers the responsibilities of the refueling supervisor. This sub-paragraph does require that all possible ignition sources be restricted within 50 feet of the fueling operation, but places the responsibility for control of this 50-foot radius with the supervisor and does not require the use of warning signs.

Toots

F-4 WHEEL KEY FAILURE

Presumably all you F-4 types are aware of the brake disc drive key failures in F-4 wheels, PN 5000504. The depot has recognized the problem and designed a new key which is now in production. This new key has a greater radius in the bend area, and the heat treating procedure has been changed to eliminate case hardening of the material.

Now here is the problem. Replacement of the drive key is being accomplished at the time of wheel overhaul, and on an attrition basis. (Wheels manufactured after 1 October 71 have improved discs installed.)

Replacement on an attrition or overhaul basis will take a long time, and failure of one drive key disc can cause a locked brake, loss of directional control and a busted bird. So what can you as flight line mechanics do to prevent this? Continue the inspection of the keys. This should be accomplished after each flight until the keys are replaced with the new item. Any indication of cracks, chips, excessive wear or looseness of the keys (indicating that the mounting screws are pulling loose) should be reason for removal of the wheel for further inspection and possible replacement.

QUALITY, WHERE ARE YOU?

When the primary hydraulic system failed shortly after takeoff, the RF-101 pilot aborted the mission and immediately returned to base

It didn't take long to find the problem. The right aileron actuator pressure hose had ruptured, and for logical cause. A medium pressure hose had been installed instead of the required high pressure type!

FOLLOW THE BOOK

The main gear of a T-37 would not extend—hydraulic pressure zero—and the pilot was physically unable to pull the emergency extension handle. He landed the bird in foam on the nose wheel, lowering the tail as airspeed decreased.

The causes were several: hydraulic pressure was zero because a line to the nose wheel steering unit had been crimped and all pressure was lost when it failed.

The emergency system handle could not be pulled out because the teleflex cable and conduit were corroded so badly that the cable had frozen.

Two days earlier, maintenance had been performed on the landing gear system which required an emergency extension system operational check. It was not performed.

The technicians involved not only violated the mandatory requirements of tech data, they violated basic common sense. The last thing the Air Force needs is this sort of shade-tree technology.

If for some reason you feel that any of the established requirements are not necessary, or if you know a better way, TO 00-5-1 tells you how to get the system changed. Until suggested changes are approved, the requirements of the tech order are mandatory.

It seems the bird had just returned from IRAN, where the hose was replaced. To frost the cake, this was the fourth time the same error was made by the same IRAN facility.

We wonder about the use of tech data during IRAN—we wonder even more about action as a result of the FIRST report of wrong hose!



O-2 RERUN

Both engines of an O-2 were being run for maintenance in a covered revetment. The front engine cowl had been removed and was lying forward and to the right of the aircraft.

As power was advanced the cowl was drawn into the front prop, destroying the cowl and damaging the prop. This combat essential aircraft was out of commission an additional 28 hours.

*See **Aerospace Safety** magazine, last February, page 22, "He Blew It." The above sounds like a rerun. Pass the word!

F-4 BREECH CAP

During climb the F-4 pilot discovered his right throttle jammed. He managed to get it out of AB range but could not retard it below max military. Fuel was burned down, the engine shut down with the master switch and an uneventful RTB accomplished.

The assistant crew chief blew this one when he failed to lock the starter cartridge breech cap into position during installation. The breech cap fell loose during takeoff and jammed against the torque booster clevis link.

T-38 POWER SHAFT ASSEMBLY

Installation of the J-85 engine to the airframe-mounted gear box drive shaft is critical. Strict compliance with TO 1T-38A-2-6 must be exercised to insure proper installation and positioning of the snap rings.

The snap rings are interchangeable and can be installed on either end of the shaft. The problem is the beveled edge. One side of the ring is beveled and must face out. In other words, the two rings must face each other. Recently a T-38 was on downwind when the left generator and utility hydraulic warning lights came on, followed by vibration and grinding. The engine was shut down.

The retaining rings had been installed in reverse (bevel side inward) which allowed the shaft to disconnect. Fortunately, the damage was minor. An extreme hazard exists if the shaft disconnects in flight. Should it come in contact with the main fuel feed line, an in-flight fire could result.

Following the step by step procedures in the TO is a must during all maintenance on the drive shaft or couplings. A further word of caution: When following the TO, make sure you are following instructions for the specific assembly on your aircraft—in the case of the T-38, the Bendix or Northrop assembly instructions are the applicable ones.

LOOK AT THESE TWO PICTURES

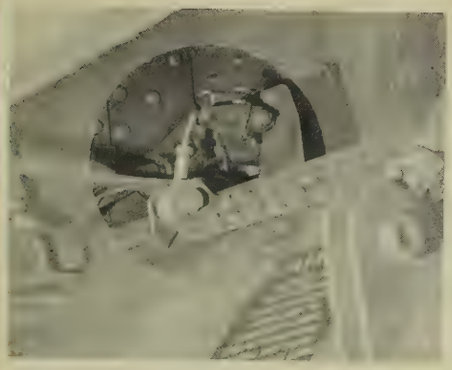


FIG 1

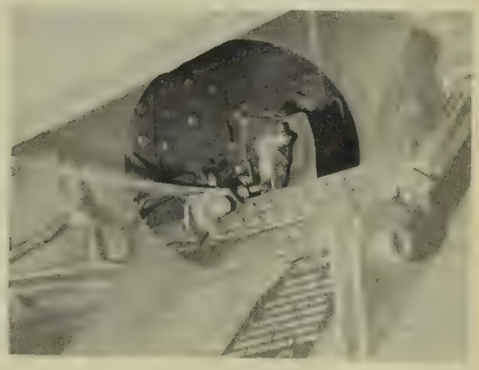


FIG 2

F-4 MAINTAINERS

Look at these two pictures. Figure 1 shows the auxiliary air door switch arm properly connected. Figure 2 shows the switch arm connected WRONG! If you'll think about it, you'll see that there is no way for this door to close without breaking some portion of the switch arm.

So what happens?

During engine start, these doors start to close, then reopen during electrical power interruption as the generators are brought on the line. The switch arm breaks at this time and the switch lever is free to swing to any position. If it goes up, the pilot gets an immediate "Aux Air Door" light in his warning panel. If it stays down, the light won't come on until he retracts the gear. Perhaps the switch lever will vibrate up on takeoff and the pilot will have to decide whether to abort or continue. Either way, the mission is lost as flight with the door open is severely restricted. As far as the pilot knows, the door is open and he may be in for some real trouble with that engine or his hydraulics. Even if his wingman confirms that the door is closed, he has lost his door warning system and that's enough to overcome his anti-perspirant and fog up the cockpit. If you think he's tight-jawed now, wait 'til he gets back and finds out what caused it!

Cut this item out and pin it on your bulletin board. Each time the aux air door hardware is disconnected (to facilitate other maintenance, maybe) you have another golden opportunity to put it back together WRONG. The cost of the broken switch is nothing compared to the cost of a late takeoff, an aborted mission, or an aircraft lost during a highspeed abort on the runway. These are the modern "horseshoe nails" that cost us horses, riders, and battles.

USE THE T.O.

During climb, the IP noticed that the student was having difficulty maintaining climb attitude. The IP took control of the T-38 and noted excessive forward stick pressure which could not be corrected with trim. The gear was lowered and this corrected the out of trim condition. Fuel was burned down and landing accomplished without further incident.

The horizontal tail interconnect cable shield had been bent during boattail installation. The damaged shield caused binding and failure of the cable as the flaps retracted.

How can this type incident be prevented? Follow the tech order. It plainly covers boattail installation, with a few warnings to prevent such damage to the interconnect cable.

LACK OF LUBRICATION

During touch and go in a C-141 the pilot found that pitch trim would not reset using the electro-hydraulic system. After several attempts on the manual lever, a slight trim change was noted. Next time around, a full stop was accomplished and the bird turned over to maintenance.

Review of the aircraft records showed that the pitch trim actuator had been replaced during Isocronal inspection five days prior to this incident. Inspection of the actuator revealed that it had not been lubricated during installation. The lack of lubrication led to binding and failure after the short period of operation.

WATER IN THE TANK

There are still a few T-33s around and here's one that almost became a statistic in our accident record. The T-bird was at 25,000 feet, cruising at 95 percent when the engine flamed out. The pilot got a relight and headed toward home.

Once the bird was back on the ground, maintenance found water in the fuselage tank and right drop tank. The water was removed and the engine checked okay.

Now, water in the fuel system is not restricted to the old T-bird; strict compliance with the checklist will prevent this type incident in any airplane. Take the samples from each drain as directed by tech data, and once you have taken the sample, check it and be **sure** there is no water present.

ATTENTION PREVENTION

It doesn't do much good to install safety wire on a nut that has not been properly torqued in the first place. An A-37 flamed out during rollout when the left throttle was placed in idle.

The throttle linkage lock nut was loose even-though the safety wire was installed and intact. The loose nut allowed the linkage adjustment to change to the point where the fuel control was in cutoff when the throttle was in the idle position.

It doesn't take much imagination to understand how this type incident could occur, nor does it take a genius to figure out how it could be prevented. Proper torquing of the nut before the safety wire is installed would do just that.

THEY DIDN'T D

An F-101 was cruising at 16,500 feet on a local photo training mission when the aircraft suddenly rolled left. The pilot righted the aicraft, turned off the yaw damper and started a descent. While passing through 10,500 feet the aircraft again rolled rapidly to the left. The aircraft was righted and the autopilot circuit breaker pulled. At this time the rudder

LOCAL MAN

While on an inverted roll-in on a rocket pass, the OV-10 pilot noticed zero torque and very low oil pressure on Nr 2 engine. The mission was aborted, prop feathered, stores jettisoned and the aircraft returned to base.

Maintenance had substituted an aluminum oil line for the stainless steel line required by tech data. The aluminum line failed with subsequent system failure.

IF IT WON'

Some people will go to the extreme to do the job incorrectly. A C-130 that aborted because of Nr 4 gear box oil pressure fluctuation provides an example.

A check of the bird revealed a badly bent motor casing on the oil tank shutoff valve. The bent casing would not allow the valve to fully open, restricting oil flow to the pump.

THE WHOLE THING

pedals could be moved two to three inches from neutral, with resistance, but would not return to the neutral position. A straight-in full stop was accomplished without further incident.

The rudder feel system cylinder had recently been repaired, but the system had not been properly bled in accordance with tech data.

FACTURE

Local manufacture of aircraft tubing is standard procedure; however, this task should be accomplished in strict compliance with tech data.

Supervisors, do your personnel know the manufacturer's specifications for those items being locally fabricated? Are you sure they are complying with the specifications?

IT, BEND IT

The maintenance team looked a bit further and found that the valve was installed upside down on the motor. In this configuration the valve assembly would not fit in the designed location. The individual doing the job apparently decided that by bending the casing the assembly could be installed, which is just what he did.

Shade tree mechanics we can do without.

FOR LACK OF GREASE

Two hours after takeoff, a vibration was felt in the KC-135. A visual scan revealed that the right outboard spoiler was raised approximately six inches. Depressurizing the right hydraulic system and pulling the outboard spoiler circuit breaker failed to correct the problem. A controllability check indicated that the aircraft could be landed with flaps and left aileron to counteract the right spoiler.

The problem was traced to corrosion and binding of the spoiler control linkage. This linkage requires lubrication every 120 days and it should have been accomplished during corrosion control phase two, less than 120 hours prior to the incident. Apparently this item was overlooked.

Compliance with each item on every workcard would prevent this type incident.

CRIMPED SEAL

Seven hours into the flight, the oil pressure warning light in the RC-135 began flickering, followed shortly by Nr 4 indicator fluctuation. The throttle was retarded, but fluctuation continued and, in fact, increased to between 0 and 70 PSI. The engine was shut down. Oil pressure remained between 10 and 30 PSI at windmill rpm during return to base.

Inspection of the main oil filter "O" ring seal revealed that it had been crimped and cut during installation. This was the second such occurrence in this unit in less than two months. Quality control has been instructed to make seal replacement an item of special interest in the future. Sounds good; however, the man doing the work and his immediate supervisor might do well to also make seal replacement an item of special interest.

NOZZLE FOD

When the F-4 pilot selected AB to close on the Dart target, the left AB failed to light. The chase pilot saw occasional ignition in the igniter area but the flame would blow out immediately after light-off. Afterburner was selected several times with the same result. During the last attempt the throttle was left in AB range for a short period which resulted in compressor stall. The engine recovered immediately when the throttle was moved out of AB range.

After flight, the aircraft was test run on the trim pad with the same results. Close inspection then turned up a five-eighths inch deep well socket wedged between the inner and outer sections of the exhaust nozzle at the six-thirty position. The socket was removed and the AB performed normally.

Five days prior to this incident a crew chief of another F-4 found a socket in the same position during preflight. It is believed that during TCTO 2J-79-1180 the sockets were used to prop open the nozzle and were not removed.

Insuring proper utilization and control of tools is the responsibility of both the man who does the work and his immediate supervisor. ★

EXPLOSIVES

. . . LET ME COUNT THE WAYS

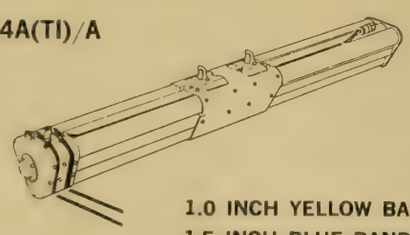
HY BOSCH, Directorate of Aerospace Safety

Each explosives accident tells a different story. Let me tell you of one recent occurrence in which a series of circumstances contributed to the final action.

ACT I, Scene 1. An organization decided to order dummy BLU-3/B bombs for training. Instead of requesting the inert stock listed bomblet (BDU-28/B) they ordered a complete dispenser load (CBU-14A (D1)/A). As none were in stock the depot suggested substituting with the CBU-14A(T1)/A. *No one mentions that while the bomblets are inert they do have live fuzes containing explosives. This information is contained in the Stock List and item Tech Order.* Thus the stage is set for the ensuing drama.

ACT II, Scene 1. The CBU-14A(T1)/A has arrived. The container is marked "Ammunition—Nonexplosive." *The intent of this Department of Transportation marking is not to imply the munition is inert, but, rather, that the container (CNU-80/E25) will retain the explosives energy should an inadvertent actuation occur within the container.* The dispenser does not have the tell-tale yellow band to indicate explosives. *It was loaded prior to that requirement.* Based on the above, one bomblet is removed from the dispenser, *a procedure forbidden by the Tech Order and AFM 127-100.*

CBU-14A(TI)/A



1.0 INCH YELLOW BAND
1.5 INCH BLUE BAND

ACT II, Scene 2. Bomblet in hand, a council of seven wise men is called. "The TO," says one, "indicates a bomb with a live detonator is painted red and this one is blue." "Besides," says another, "this bomb has white markings which say Inert Loaded." No one mentions the yellow band. No one reads after the words "Inert Loaded" where it states "with live fuze." The council is polled and the motion to take the bomb apart for the purpose of making a training aid is carried (another tabu).

ACT III, Scene 1. The fuze explodes . . . fortunately with only minor wounds.

From off stage a Greek chorus intones

There once was a man who wished
He'd noticed the band he missed
For yellow's H. E.
And easy to see
If you fail to check Stock Lists. ★

BDU-33A/B HANDLE CAREFULLY!

CAPT CHARLES B. STUTTS, JR., Directorate of Aerospace Safety

Operational BDU-33A/Bs are extremely hazardous because, unlike most of our munitions with built-in safety features, this BDU may function if dropped or released from normal maintenance or loading heights. Once the MK 4 Mod 3 Signal Cartridge is installed, careful handling by maintenance and loading personnel

is essential. A recent explosives accident demonstrates the potential dangers of this practice bomb:

During maintenance which required inspection and handling of numerous BDUs, the nose of a BDU-33A/B slipped from a technician's hand. The man unsuccessfully tried to retrieve the bomb and turned away as the spotting charge functioned. The inertial tube was propelled into the technician's hand, fracturing a bone, then continued on to strike the ceiling of the maintenance bay and ricochet off a wall. In addition, red phosphorus got into the technician's eyes.

The primary cause was personnel error, with the use of soiled, heavy duty work gloves as a contributing factor. Of course, this accident could have been even more serious if the inertial tube had struck the technician on the head, or if the red phosphorous particles were not immediately flushed from his eyes.

The BDU-33A/B has not been produced for the last two and one-half years so the supply should be almost exhausted. Its replacement, the BDU-33B/B, has a safety pin installed to prevent cartridge functioning if inadvertently dropped. Until the supply of BDU-33A/B is completely exhausted, supervisors and technicians should ensure that these older (A/B) models are handled with extreme care. ★



LAST CHANCE

LT COL GEORGE H. RICHARD, Chief Quality Control and Evaluation Division, DAVIS-MONTHAN AFB, Ariz.

A technician, in the process of changing soft goods on a Titan II engine, interchanged the two stage I oxidizer bootstrap venturi. The sub-assembly Nr 1 venturi was placed in the Nr 2 position, and vice-versa. In this case, the effect on engine performance would have been minimal. The implication, however, is worth consideration. Many flight critical operating components of the Tital II system are not "operationally checked." It's obviously not reasonable to test-fire rocket engines on installed missiles to verify thrust performance.

Similar "operational status" problems exist where the proof lies in the use or destruction of the component. All these things cannot be operationally tested (except through sampling), because they would be destroyed after their one-time useful purpose had been served. The reliability and proof of the composite weapon, therefore, rests with the meticulous care taken by each specialist in the accomplishment of his portion of the "receipt-to-launch" functions; and once verified by inspection to have been accomplished without error, further access to critical flight components must be competently monitored to insure configuration integrity. "Do it right the first time, *all* the time" carries an additional postcript when applied to the strategic missile force, and that is: ". . . because you won't get a first chance at correction." ★



"ONE MORE TIME"

I am curious about an article which appeared in your August 72 issue on page 21, entitled "One More Time." The article refers to a T-39 incident which involved a tire blowout from overheating. The T-39A Dash One states on page 1-44 "Each main gear wheel is equipped with three fusible plugs that will melt and release tire pressure before the wheel and tire become dangerously overheated."

What happened to these plugs on this incident since your article states no discrepancies were found?

Maj Jerry L. Caskey
Austin, Texas

The best we could come up with is as follows: (1) the fusible plugs were undisturbed; (2) a test of the tire administered by the fire department disclosed no signs of overheating; (3) the tire failed due to some unidentified defect in the tire.

So, we erred in assigning overheating due to successive high-speed aborts as the reason for the tire's failure. We regret having missed the discrepancy in the report. On the other hand, primary message is a good one: there's precious little reason to "give it another go" after a serious discrepancy has prompted an aborted takeoff.



"RESPONSIBILITY, PILOTS OR CONTROLLERS"

LT COL WARD J. BAKER,
Chief, ATC Procedures Div, HQ AFCS

The article "Responsibility, Pilots or Controllers," appearing in the August issue of your magazine, was indeed timely in view of the recent emphasis placed on the use of radar and the IFR system by all military pilots.

I would like to clarify one point made in the lower left hand column on page 17. The author implies that the issuance of traffic advisories is mandatory for IFR aircraft. This is not true. Traffic advisories are given to both IFR *and* VFR aircraft on a workload permitting basis. Frequently the limitations of the radar, volume of traffic, communications frequency congestion, and workload, will prevent a controller from providing this service. Therefore, pilots on IFR flight plans should not be lulled into a false sense of security by thinking they will always receive traffic advisories.

HQ AFSC has, on many occasions, advised its controllers to provide this service to the maximum extent possible. We're confident that with the introduction of the TPX-42 radar beacon system, which displays altitude readouts on AIMS equipped aircraft, controllers will be able to issue pertinent traffic advisories in a routine manner rather than as an additional service.

Lt Col Ward J. Baker
Chief, ATC Procedures Div
HQ AFCS

Correction

In the article, "Oxygen Quick Check," August, page 14, six words were inadvertently omitted. The omission is in the last paragraph, middle column, in the sentence beginning "The danger with a regulator turned off . . ." The sentence should read, "The danger with a regulator turned off *and in the normal oxygen setting* lies in the fact that the user can breathe normally, as if he were getting oxygen, to cabin altitudes above 20,000 feet."

☆ U.S. GOVERNMENT PRINTING OFFICE 1972 789-396/3

NITED STATES AIR FORCE

Well Done Award

Presented for outstanding airmanship and professional performance during a hazardous situation and for a significant contribution to the United States Air Force Accident Prevention Program.



Major DONALD P. MILNER

1st Special Operations Squadron, APO San Francisco 96310

On 2 February 1972 Major Milner led a flight of two A-1s on a combat sortie. Two hours and twenty minutes after takeoff, while pulling up to check a FAC marked target, his oil pressure dropped to zero. Another A-1 flight orbiting in the target area informed Major Milner that his aircraft was trailing black smoke. He immediately reduced power and asked for a heading to a small airfield controlled by friendly forces. The other A-1 flight provided the heading and informed him that the trailing smoke was becoming more intense.

After jettisoning his external stores in the target area, Major Milner turned toward the friendly field. On rollout, the oil sump chip light illuminated. Seconds later the engine seized and the propeller shaft turned freely, disabling the AC and DC generators and the hydraulic pump. Major Milner established a forced landing pattern, and completed the emergency checklist using the auxiliary electric pump to lower the gear and flaps before the battery discharged.

After touchdown on the very short runway from which a cliff rose at the end, Major Milner used maximum braking until it became apparent that this would not be sufficient, then at 50 knots he unlocked the tailwheel steering and ground-looped the aircraft to a stop.

Under extremely challenging conditions, Major Milner recovered a valuable weapons system at a field used primarily for STOL and helicopter operations. WELL DONE! ★

KNOW YOUR EMERGENCY PROCEDURES....

Keep Them in Sequence!



Don't Tell Your Bird A BOLD FACE Lie!

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UNITED STATES AIR FORCE **DECEMBER 1972**

Aerospace SAFETY

FOR AIRCREWS, MAINTENANCE & SUPPORT TECHNICIANS

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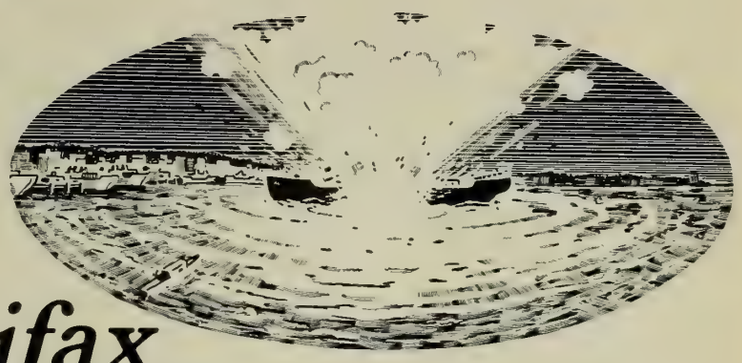
DEPARTMENT OF THE AIR FORCE • THE INSPECTOR GENERAL, USAF

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DECEMBER 1972 AFRP 127-2 VOLUME 28 NUMBER 11

HISTORIC HOLOCAUST

HY BOSCH
Directorate of Aerospace Safety



When Halifax Was Destroyed

Miraculously one telegraph line was left. Over its wire sang the message that shocked the world. An explosion had destroyed Halifax.

During World War I North America was both the breadbasket and arsenal that sustained the conflict in Europe. Ships would take on cargoes at the east coast ports and head for Halifax, Nova Scotia. At that port convoys were formed for the perilous Atlantic crossing. It was Halifax's strategic location that led to its downfall.

On December 1, 1917, in New York, 5 million pounds of explosives were poured into the holds of the steamer *Mont Blanc*. Almost as an afterthought an additional urgently needed 488 thousand pounds of benzol in drums were lashed to its decks. On December 6, this mixture of explosives and volatile liquid was heading into Halifax. At the same time a Belgian relief ship, the *Imo*, was heading out. Harbor traffic prevented the *Imo* from taking a track that would allow the ships to pass port to port. Instead, they were on a collision course. At the last moment the ships' masters attempted evasive action but they were too late. The *Imo* rammed the explosives carrier. Immediately the decks were aflame with burning benzol. Realizing they were riding a time bomb, the Captain and crew of the *Mont Blanc* abandoned ship. Now uncontrolled, the burning vessel drifted toward the docks and city. Hundreds watched in awe as two naval longboats raced to secure the ship and change its course. The quick and deadly benzol won the race. It reached the explosives and the thunderous explosion destroyed long boats, docks, ships and town.

The quantity of explosives and its proximity to the city caused unprecedented death and destruction. There were 1800 fatalities and 8000 injuries. Hundreds of the injuries resulted in blindness when people rushing to their windows upon hearing the explosions were caught by shattering glass caused by the following shock wave.

Buildings were severely damaged for a distance of 1¼ miles while missiles were thrown up to four miles. Fires caused by overturned stoves contributed to the havoc. As if that were not sufficient, that night a blinding blizzard disrupted rescue efforts.

Halifax was destroyed 55 years ago; yet today each Air Force base with combat aircraft has the ingredients for such a calamity. Military aircraft require both explosives and combustible fuels to perform their mission. To prevent another such holocaust we must insure the compatibility of explosives with aircraft, train our people to conform with technical data and adhere strictly to prudent safety practices.

The frequent incidents involving explosives are warnings that we cannot ignore. Too often we see the results of improper procedures, careless handling, failure to follow tech data and deficient supervision. Must we have another Halifax to teach the seriousness of these deficiencies? ★

REFLECTIONS

Ok guys, sit back, prop your feet up, adjust your glasses (if required), loosen your belt (again, if required) and let's do a little soul searching about 1972. Just about everybody thought '71 was a banner year in the safety business. We crept a little closer to that magic figure of a zero accident rate, so there was no reason to think that '72 might reach up and bite us where we least expected it! In 1970 a rate of three accidents per 100,000 hours was a record, but in 1971 we edged down to 2.5. Unfortunately, Lady Luck's smile was a bit thinner in 1972.

For openers on this ponderous subject there are a couple of things that we're just going to have to buy. First of all, it's you and I who cause accidents. We haven't had one single flying machine crank itself up, taxi out and take off without some kind of help. Not one airplane forgot to put its gear down or failed to follow the checklist, nor can I think of a single nut that over- or under-torqued itself. Maybe we'd better face the mirror and stand up while we talk about this, just to be sure that the right guy gets the straight skinny.

Of course somebody is going to say, "well there was nothing that could be done to prevent that one—the widget just broke." In the first place the widget broke because it was either (1) underengineered or (2) overstressed. Get the picture? *Somebody* caused the failure.

Maybe we were just lucky last year but it sure seems like '72 has provided us with some real "dumbs." We have found that the best way to prevent a repeat accident is to learn from the original. It's much, much less painful to learn from the mistakes of others than to go through the same exercise just to make *sure* that was the best way to goof it up. The head shrinkers tell us that a guy who forgets to put the gear down and slides to a stop is very unlikely to do that little trick again. Yet, the next day somebody else goes out and proves again that the gear won't come down all by itself. (Kinda like reinventing the wheel, isn't it?)



So sit back down, get a good grip on the chair and let's see how we managed this year to break some machines that should still be doing their duty.

For some reason airplanes continue to surprise us. We fly a bird for years and suddenly find that there were some things missing from the instruction book that should have been put there when the machine was first built. An after-the-fact investigation revealed that "accurate take off acceleration check-speed data or abort criteria are not available in the T.O." And that "a partial power loss can occur which may not be detected from existing instruments." Wonder who and how many people overlooked that one? It cost us an airplane and a pilot.



Here's another one. Ever seen a JP-4 truck parked in front of a recip? Somebody must have, because we managed to do it twice in a row at the same place. Just one airplane crashed—but only because just one took off. It's speculation as to how many gimmicks we have devised to prevent this most obvious event from occurring, but they must number in the hundreds. Yet we still manage, somehow, to beat the system and pump kerosene into gas tanks.

We know that mistakes are going to be made or we wouldn't put erasers on pencils or emergency procedures in a prominent place in the -1. One thing we can't legislate is that, when the time comes, the guy who has to cope with an emergency will follow this advice. One report says "Pilot Factor in that the pilot failed to use correct procedures

during an inflight emergency and lost control of the aircraft" Sure, we know that common sense often dictates an alteration in the preplanned response, but remember too that these emergency procedures were worked out in the comfort of an air conditioned office and not under the pressure of a disintegrating airplane. Give them a chance. This one cost us a machine and lives.

Most of us who fly airplanes with two (or more) engines take it for granted that the warning lights won't lie to us . . . and in most cases this is true. But let's mix things up a bit: How about a little touch of carelessness in hooking up the fire warning loops, like wiring No. 1 fire circuit to No. 2 engine and vice versa? Now add one more ingredient . . . a fire. By the time the crew figured out that they had shut down a good engine and added power to the sick one we lost an aircraft. Just pure maintenance personnel error.

Many words have flowed across the pages of all the safety mags over the years stressing the dangers involved in various optical illusions. We talked about fog, rain on the windshield, sloping runways, snow, etc., and yet we still have pilots who land short and wipe out the aircraft. We felt so strongly about the subject that most of our runways now have VASI lights that will help you anytime you are on an approach. Pilots still land short on a 10,000 foot runway because they misjudge their approaches. *Pilot technique.* Use all the aids available to you every time you land your bird and we'll eliminate this kind of loss.

"The cause of the fatalities was pilot factor in that ejection was not initiated even though conditions were favorable for approximately 30 seconds." Look at the sweep second hand of your watch. Let it tick off thirty seconds. Long time isn't it? How long does it take to make the decision to wash your hands of the whole mess and pull the handle? Every year we have pilots who delay making this decision until it's just too late. We almost wish we had the reverse problem . . . pilots who decide to leave when there is a good possibility the bird could be recovered. But this is not the case. Because of the reluctance of a pilot to admit that the situation is beyond his control, we lose good men. The time to make this decision is NOW —not when you are running out of altitude, airspeed and ideas. It may be cold outside the cockpit but not nearly as cold as that permanent wooden overcoat.



We mentioned earlier that people are going to make errors. We *know* that. Admit it when you do and perhaps we could prevent a few accidents. Did you hear the one about the troop who was taking an oil sample and let the plastic bottle slip? It went smartly down the filler neck. Not a very nice thing to have to trot back and tell your supervisor about . . . so he didn't. We lost an airplane because somebody was afraid to tell his boss. Wonder how he felt when he heard the airplane had crashed? About the same as the supervisor who signs his name that he has inspected work performed but when, in fact, he never left the maintenance shack, I guess.

The list is almost endless. Poor planning by aircrew, lack of knowledge, shoddy work by technicians performing maintenance, lack of professionalism—all these are going to cost us dearly. I said the list is almost endless. There should be an end somewhere because we just haven't found many new ways to break flying machines over the past seventy years. The same basic cause factors can always be found. We just repeat the same ones with variations. When do we start learning to profit by the mistakes?

The picture is not all bleak, however. We still managed to cope with more than 15,000 incidents, many of which, by a whisker either way, could have ended up in a smoking hole. We still manage to get the mission off on time and fly many more uneventful missions than those comprised primarily of stark terror. So our hats are off to those who perform their task as perfectly as pos-



sible. If you're still looking into that mirror you must be one of this group. If you can't look that reflection in the eye . . . well, January One is rolling around, and maybe it's time for some new resolutions. ★

THE IFC APPROACH

By the USAF INSTRUMENT FLIGHT CENTER
Randolph AFB, Texas, 78148

RUNWAY ENVIRONMENT

AFM 55-9, TERPS, defines runway environment as "the runway threshold or approved light aids or other markings identifiable with the runway." The USAFIFC is frequently asked to amplify this definition, particularly with respect to "other markings." To fully understand the terminology one must apply it to many situations. Consider the following examples:

1. You are flying a night precision approach in near minimum visibility. Visual references will be very limited in this situation. Total instrument flight must be maintained until sufficient visual cues remain in view to determine the aircraft's vertical and horizontal position in relation to the runway. The visual cues will probably be limited to the approach lights, the runway outline lights, touchdown zone and center line lights, if available, and the runway markings.

2. You are flying a non-precision approach to circle for landing. The ceiling is cloud based with two miles prevailing visibility. In this situation there should be numerous visual references available. Runways, taxiways, ramp areas, hangars, runway markings, overruns, and lights associated with the runway of intended landing will assist you in maneuvering to a position from which a safe landing can be made.

The total situation during the time of approach will determine what visual references can be used for descent below DH and MDA. Lighted advertising signs, buildings, houses, and other landmarks far from the end of the runway **should not** be used to determine aircraft position in relation to the runway. These features could be confusing and easily misinterpreted in the absence of additional supporting visual cues. Also, they are not under the control of airfield management.

Other markings identifiable with the approach end of the runway should be reliable pilot references and features that can be previewed and anticipated prior to the approach. The most accurate information available is the airfield diagram on the instrument procedure.

USAFIFC GREETINGS

This month marks the eighth year of continuous monthly articles from the Instrument Flight Center. Hopefully, the information in these articles has enhanced your knowledge of instrument flight directives, procedures and techniques. Our purpose has not been to provide flight examiners with tricky questions, but rather to satisfy your needs for more information on instrument flying. Questions and answers, techniques for accomplishing instrument procedures, and discussions on the basic procedures have been presented to promote safety through education.

In our attempt to develop and perfect an instrument procedure, the user has the most important role in the communications loop. If you are interested enough in your profession, ask a question. Since the USAFIFC was established to serve you, why not let us know when you either don't understand, or think a condition can be improved. We welcome your inquiries. USAFIFC/FSD, Randolph AFB TX 78184, AUTOVON 487-4884/3092.

The USAF Instrument Flight Center extends best wishes to you and your families for a Merry Christmas and a safe New Year.

DESIGN DEFICIENCY

The design of an instrument approach procedure, from conception to publication, requires many hours of planning, calculating, and coordinating. From the myriad considerations evolves an approach that will provide a safe means of using terminal airspace if flown as depicted.

Occasionally, printing or design errors occur in spite of the efforts to avoid them. If a mistake is known or suspected, attempt to contact the operations personnel at the aerodrome responsible for the approach procedure, or consult any FLIP publication for correction guidance. Official pre-addressed cards are available at base operations. You, the jock, can assess the approach procedure through actual use, and your comments are solicited. Your inquiries will be investigated thoroughly.

RESTRICTED AIRSPACE

Flights through restricted airspace are prohibited during published time periods, unless permission is obtained from the *controlling authority*. Recently, an unsuspecting jock verified this in a rather embarrassing way when he deviated from his cleared route of flight to avoid thunderstorms. Luckily, the unauthorized penetration was uneventful even though the area was extremely hazardous to aircraft and aircrews.

Air Route Traffic Control *may* act as the clearing authority, but not in all instances. (Refer to R-1507B, Holloman AFB, NM. Also, see Special Notice, New Mexico, FLIP II.) If you intend to fly through or near restricted airspace, the USAFIFC recommends that your preflight planning include an alternate route clear of the restricted area in case of inclement weather or other unforeseen circumstances.

POINTS TO PONDER

When checking the IFR Supplement for your destination, note the listing of RADAR frequencies. You may find the symbol (EX), which indicates that the emergency frequencies will be available *only on request.* Since GUARD frequency is not being monitored continuously, don't expect immediate RADAR vectoring by GCA should your emergency situation warrant a GUARD transmission. ★

by the book--later

"The cause of this accident is that the Dash 1 is not clear."

or

"The cause of the accident is that the loading checklist sequences are in error."

Those are valid findings, as recorded time and again in accident reports. At least they *could* be valid, if the Dash 1 or checklist is new, and the required action has never been done before.

On the other hand, consider the munitions loading checklist that has been in daily use for months, with no accidents or incidents. Suddenly, a loading error occurs and the checklist is found deficient.

Real life wondering leads to the question: "Why no earlier errors?" Was it *really* the checklist, or had load crews recognized the problem, and adjusted their own procedures, without telling anyone? What happened during munitions standardization evaluations? Was the real problem the checklist?

Aircraft accidents bring forth similar findings, often pointing out that Sections II and III, I and VI, or III and VII don't agree. Who should be considering this? Certainly this type of book review is not of the type reserved solely for accident investigating boards.

Want a pointed example? After an ancient C-47 departed the runway on takeoff, it was alleged that the "book" was deficient! We wonder how many million times the "book" was used, and the words applied, before this accident!

Though that example is gross, it seems to lead to the point of our story. The time to consider adequacy of tech data, whether of the flying, maintaining, or supporting type, is when it is first put to use.

This evaluation should continue, with errors reported promptly, as they are identified.

After-the-fact is too late for accident prevention! ★

PRIMARY

It has been my own observation that when an aircraft accident occurs, most aircrews have two questions: "How is the crew?" and "Who/What caused it?"

I recently had the unfortunate experience of being forced to ask a third question: *"What could I, as a supervisor, have done to either prevent the accident or to prevent the death of two young outstanding Air Force Officers?"* This last question hit me especially hard as the supervision aspect was two sided; I was both the leader of the flight and Operations Officer of the squadron.

Our squadron mission is typical of that of many TAC fighter squadrons: We train aircrews to deliver conventional ordnance accurately. These aircrews range in experience from recent graduates from Undergraduate Pilot Training to the experienced fighter pilot. Our graduates go to SEA, overseas units, Air National Guard and the Air Force Reserves.

The flight on this particular day was to be a Ground Attack Tactics mission with practice ordnance. We were scheduled as a flight of two to the tactics range to work with a Forward Air Controller. As the Instructor Pilot in the lead aircraft, I briefed the mission and concentrated on the techniques and possible problem areas that generally occur on this type mission at this particular stage in the program.

My student was a Captain in the Air Force Reserve and had never flown fighter-type aircraft before. I was very pleased with his progress to this point and was sure that the "lightbulb" was about to illuminate so that his delivery accuracy would start to come down to where it belonged. John, the Instructor Pilot in the other aircraft, had a young pilot who had just graduated from UPT as his student and this young jock was having no trouble that a few more bomb passes wouldn't cure.

Start, check-in, and taxi were normal except that the tower changed the active runway after we started to taxi. This meant we had to reverse our taxi route to the new runway and it took longer than usual to get to the arming area. In addition, the quick-check crew and gunplumbers had to move and it took them a few minutes after we arrived to get into position.

We took off with fifteen seconds spacing and I noticed that we had an unsafe indication on the gear after retraction. I told my student to maintain below gear limit speed and to recycle the gear. This unsafe indication is not an uncommon occurrence in our type aircraft since a low-time pilot will allow the airspeed to accelerate too fast on takeoff which will prevent the gear doors from closing after the wheels are in the well. I also called John that we were slowing up to recycle the gear and he answered "Roger."

The gear went down o.k. but still indicated unsafe on retraction. I took control of the aircraft and could feel a slight buzz or buffet in the controls, so I asked John to come up to look me over and I started a gentle right turn. I looked back at my five o'clock position and noticed John in a normal formation join-up with the speed brakes de-



CAUSE

MAJ JACK DRUMMOND, 23d Tactical Fighter Wing
England AFB, Louisiana

ployed. He seemed to be overshooting slightly and I lost sight of him as he passed to my six o'clock position when I looked back to the front to scan for other traffic.

At the time that I expected John to advise me if anything was wrong with my aircraft, he made a transmission that was calm, cool, and garbled. The only thing I understood was the word *engine* somewhere in his statement. Both my student and I looked at our engine indicators as we felt that John had reported something about our engines. We saw nothing wrong so I asked John to repeat his statement. We received no answer so I reversed the turn back to the left and saw a column of black smoke coming up through the trees. At this time I looked at my altimeter and we were climbing through 1600′ AGL.

The investigation revealed the following facts that are important to my question of *"What could I, as a supervisor, have done to either prevent the accident or to prevent the death of two young outstanding Air Force Officers?"*

1. John's calm, cool, and garbled radio transmission was: "(——) tower, (call sign) has had a double flameout. We are starting number one."

2. John and his student ejected so low that the risers did not get out of the bag.

From my supervisory standpoint of the flight lead, why didn't I:

1. Stress to John and his student in the briefing that if both torches quit below 2000′ AGL, get out? I had told my student this many times but not on this specific day.

2. Ask John immediately to repeat the radio call that I had not understood?

3. Tell John and his stud to get the hell out of that airplane?

You may add to this list.

From my supervisory standpoint of Squadron Operations Officers, why didn't I:

1. Monitor the progress of John's student more closely?

2. Notice if John had been upset or overworked lately?

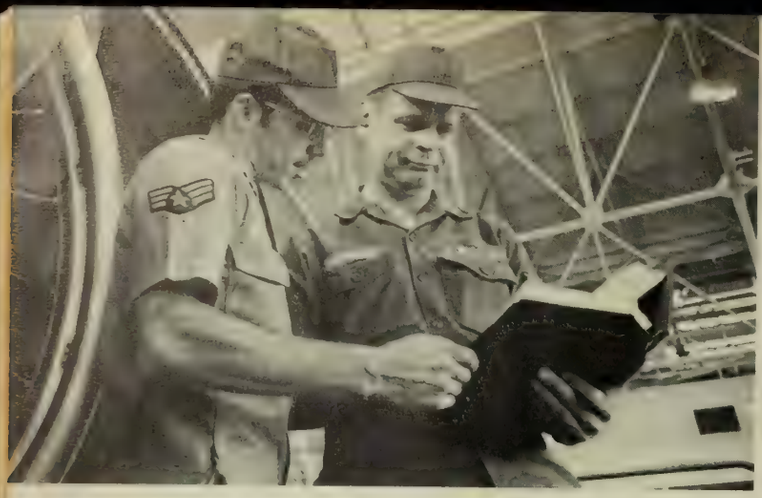
3. Punch up the Squadron stan/eval guy to keep the jocks on their toes about ejection parameters?

4. Talk to all the jocks about my own feelings of ejection versus the attempt at winning the TAC Aircrew Achievement Award or the USAF Well Done Award?

5. Pay more attention to the last check ride on John that I had signed off as Reviewing Official?

You may add to this list.

From your supervisory standpoint as Flight Commander, Squadron Commander, Flying Safety Officer, Stan/Eval, Quality Control, Maintenance Officer, Line Chief, Crew Chief, etc., *what could you have done to prevent the death of two young outstanding Air Force Officers?* To put things in the proper perspective, *what can you do to prevent the next one?* Each of us is a supervisor in some way, form, or fashion. Think about accident prevention from the standpoint of a supervisor and perhaps your attitudes about Flying Safety will be in for a big change. I know that mine have. ★



Inadequate Tech Data

LT COL RICHARD H. WOOD
Directorate of Aerospace Safety

A lecturer, seeking to demonstrate how poorly we communicate, dragged a volunteer from the audience and defied him to explain a simple procedure like how to open a pack of cigarettes and light one.

To prove his point, the lecturer stood behind his victim and took a fresh pack of cigarettes and a pack of matches from his pocket. As the victim described each step, the lecturer followed his instructions exactly. Very Exactly. Within minutes the stage was littered with cigarettes, the lecturer had a mouthful of tobacco, and the class was doubled over with laughter. If you need a few laughs at your next party, you might give this a try.

The poor victim never has a chance. Some things are just too simple to need instructions. We just naturally assume that anyone would know which end of the pack to open, which end of the cigarette to put in his mouth, and that you're not supposed to put it all the way in and close your mouth after it. Worse, the victim can't see what's going on behind him and doesn't know what results his instructions are producing. He has no feedback.

IT OCCURS TO US that writers of tech data are in pretty much the same boat. What seems perfectly clear and simple to them doesn't always come out that way. Occasionally, some helpful soul will stick in an AFTO 22 and point out that things are neither clear nor simple, but this system doesn't work as well as it should. Sometimes the first feedback the tech writer gets is when the plane crashes and the accident board klonks him with "Supervisory Factor, i.e., Inadequate Tech Data"! Man, what a way to get feedback! That's worse than a mouthful of tobacco!

Occasionally (on weekends and lunch hours) we in the Maintenance and Engineering Branch sit around with our feet on the table and philosophize about accident cause factors. There seems to be a tendency to get extremely nit-picky on tech order deficiencies, and we're not too sure that this is leading us in the right direction. The operative logic seems to be: if the tech data is required, and it is used, and it is wrong, then the tech data is at fault, and not the user. Put another way, if we are going to require that tech data be used and beat people over the head if they don't use it, then we're going to have to bite the bullet ourselves on any imperfections in the tech data when it is used.

There is probably an element of truth to this, but only if the tech data is absolutely, totally, and completely wrong—so wrong that Thomas Edison himself would have reversed the wires on his light bulb. In the real world, though, things are seldom totally right or totally wrong. They fall somewhere in between and the rightness or wrongness of tech orders are shaded by words like inadequate, misleading, incomplete, confusing or obsolete.

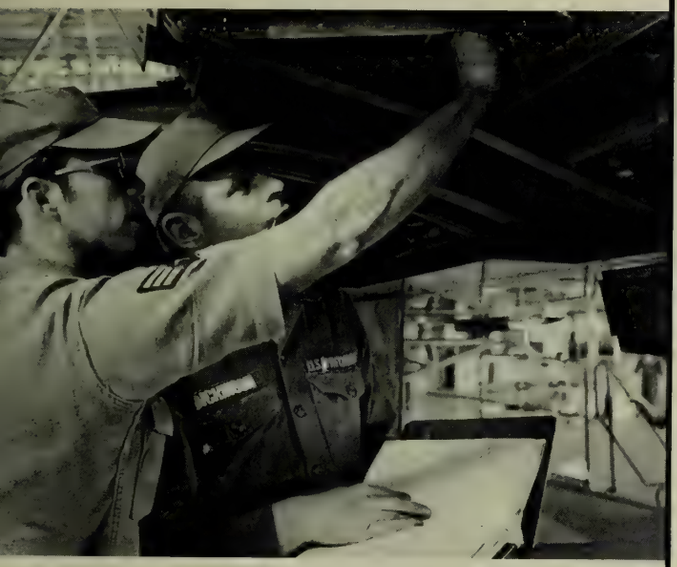
The tech order is a form of communication and it is stuck with all the inherent problems of the English language. Written perfection is largely in the mind of the writer and tech orders are fairly easy to criticize.

Aside from the problem of transferring information via the English language, there is another problem confronting the tech writer. Where does he start? What can we assume the reader of this tech order already knows? Nothing? Impossible. He must read English, understand page numbers, and recognize airplanes. If we tell him to "tighten" a nut will he understand? Or must we tell him which wrench; which end of the wrench, and how? Is it enough to tell him what needs to be done? Or must we think up all the things that must not be done and tell him those, too? Can we say, "assemble this bolt with one washer under the nut," and leave it at that? Or must we also say, "Don't put the washer under the head of the bolt, don't put more than one washer under the nut, and for heaven's sake don't leave the washer out!" Damn! The problem is worse than we thought!

What we have is an exercise in line-drawing. Where do you draw the line between common sense, basic maintenance knowledge, and tech data requirements? We don't know, but we're consoled by the fact that the

Gooney Bird Tech Orders are still under revision and that some of the "improvements" to other TOs recommended by accident boards are not themselves models of clarity. Obviously, tech order adequacy is a matter of opinion and clarity depends on who's reading it.

ANY COMMUNICATION SYSTEM worthy of the name requires a transmitter, a receiver and a feedback loop. If you're listening to someone talk and you don't understand him, you say, "What?" (or possibly, "What, Sir?" as the case may be) and all necessary elements of a comm system are present: transmitter, receiver and feedback. When the transmitter is in the form of a tech order, though, the opportunity to say, "What?" just isn't there. In a way, you could consider an AFTO 22 the equivalent of a "What?" but that's not much



help to someone who has to have the plane fixed by noon tomorrow. Anyway, in our tech order comm system we never find fault with anything but the transmitter. We never blame the mechanic (receiver) for not reading the thing carefully or for not complaining (feedback) and seeking clarification on an obviously confusing or inadequate paragraph. We rarely, if ever, say something like, "Yeah, the TO isn't too clear on that point, but we don't expect everybody to do their jobs by merely reading the directions on the package. We sent you to widget school and you are now a seven-level widget specialist. We really think that between you and the tech order, we ought to be getting some widgets that work around here. Furthermore, if the TO isn't adequate, who, but you, will notice it and tell us about it?" We rarely say that, because tech orders, people and airplanes just aren't that simple. They don't fit into nice neat statements like that.

All in all, this is a complex problem, this problem of tech order deficiencies, and we do not, repeat, do not have the answer. For what they're worth, here are a few thoughts on the subject that might be good for some discussion among the troops.

- Our tech data should be as good as we can humanly make it. That's the goal and we should never give up trying to improve our system, but . . .
- . . . if we let progress in maintenance and safety await perfection in tech data, we may have a long wait.
- Even when we attain perfection, that perfect tech order is going to be a compromise between the minimum a trained mechanic needs and the maximum he could be told. Somehow, somewhere, someone is going to have to establish that compromise position.

UNTIL THAT HAPPENS, though, we should not credit our existing tech orders with an aura of perfection that really isn't there. This isn't hard to understand, as the tech order is an inanimate thing that absorbs blame readily. It's a lot easier to point the finger at the tech order than the man and this seems to be what some accident boards are doing. Carried to extremes, the only crime will be to not use tech data; there will be no penalty for not using common sense, good judgment or maintenance training. When that happens, we will have sold out our professional competence in favor of a bunch of cook books.

Ideally, the climate should exist where tech orders are put in their proper perspective and the maintenance troops are given full credit for their professional abilities and a full share of the responsibility for exercising those professional abilities.

Most, we think, would prefer it that way. Most people respond well to the opportunity to exercise their knowledge and are willing to accept the responsibility that goes with it.

Don't get us wrong. We need tech data, we need good tech data, and we need to use it. As far as we know, though, a tech order has yet to turn a wrench, pack a drag chute, or start an engine. Planes are fixed by people and we should not put ourselves in the position where we deny ourselves their professional competence, good judgment and common sense. ★

A TWO-ENGINE GLIDER



"Now," said the IP, "I will demonstrate an engine out." He retarded power on the left engine and punched the feathering button.

"Feel the yaw? Now we correct with rudder, hold airspeed by lowering the nose, trim. Simple. Now, we'll do the same with the other one."

"But, sir, do we shut them both down in the traffic pattern?"

It didn't happen quite that way, but it might as well have . . . it was just as stupid.

The aircraft: A C-47

The crew: An IP, two 2/Lt students, a Tech Sgt flight mechanic

The mission: Transition (VFR)

Apparently all was proceeding normally during the mission, which consisted of a number of touch and go landings at both home base and another field. After nearly two hours of flight, as they were turning out of traffic after a touch and go at home base, the left engine quit.

An immediate right turn was made for entry onto base leg for another runway, the engine was shut down and the crew declared an emergency.

But their troubles weren't over. The right engine began to overspeed and it too was caged, turning the Gooney Bird into a glider. Fortunately, they had the runway made and the landing was completed without further incident.

Okay, so it was only an incident . . . a hairy story to be told at the bar. Not so, it was an incident that tried awfully hard to be an accident. Just alter the circumstances slightly and we could be talking about a fatal accident at worst, and a bashed airplane at best. But what really happened? Why two engine failures? The answers point out some glaring human errors, a carload of complacency, and procedures that invite such an event.

First, there was the IP who failed to monitor the fuel and fed both engines off the same tank to starvation. Next were the student pilot and flight mechanic who failed to monitor the fuel quantity.

Finally there was a procedure in force that, since the aircraft was remaining in closed traffic, the cruise and descent checklist need not be performed. It wasn't!

Needless to say, the unit submitted an AF Form 847 to insert a fuel quantity/selector check in the before landing checklist and a fuel system/status check by the flight mechanic every 30 minutes during all missions.

Considering the fact that the C-47 has been around for some 30 years plus, and we've been making touch and goes out of closed patterns all that time, isn't it about time we learned? ★

REX RILEY'S CROSS COUNTRY NOTES



WHAT LIST: In case you're wondering what has happened to the format on this page we've decided to publish the list of Rex bases just once per quarter. Since the list changes so slowly we see no real advantage in running the same group each month. However, rest assured that if your base is selected it will appear in a space of honor all by itself until the regular quarterly list is published.

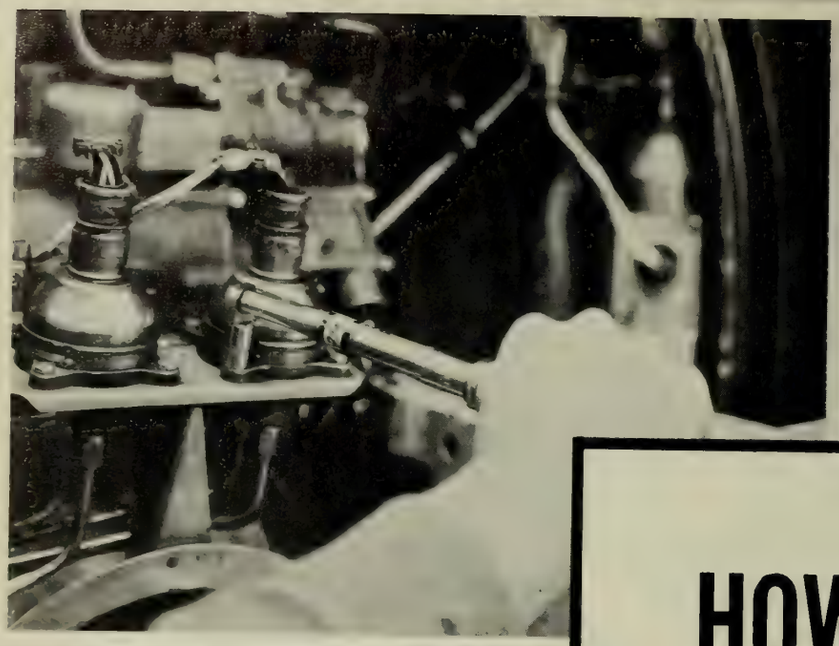
WATCH OUT: If you are like me, chances are that you feel fairly secure after you climb into the positive control traffic structure. That's when you finally relax and leave the clearance to the fellows on the scope. However, after reading a recent near miss report I'm going to keep my personal eyeballs going all the time. Seems that this military bird was at FL 330, in and out of the cirrus when a passenger jet was seen heading his way on a collision course. Evasive action resulted in about a fifty foot near miss. Traffic Control reported that they had no such traffic on their board. We still don't know the outcome of that one. So you see it is most important that you look out. It doesn't really matter who's at fault when you cross wings with another aircraft.

LOST ARTICLES: Any one had a problem with articles disappearing out of the cockpit, like gloves, checklist, helmet bags, etc? ? ? I've had a couple of recent complaints about losses. Best you let the base ops know so they can arrange better security.

SID Sense: When we first devised the Standard Instrument Departure system and published one for each base they served a very useful purpose. The radar coverage at that time was not as complete as it is now and this provided the traffic controller with a planned departure which was a definite advantage in routing traffic. Now, we have progressed to the point that almost every departure is radar monitored and in most cases we're surprised if we don't get a radar climb on course. As a result of this non-use it appears that too little attention has been given to insuring that should it become necessary to follow the SID it is clear and concise in format. I suggest that each base ops should take a critical look at their SIDs and decide if they could follow them if they were in a single seat aircraft, in weather, at night. That's the test. If not, change them.

AN EXTRA service that our tower and approach control personnel provide is recommendation that you "recheck your gear", or "squawk emergency and we'll try and locate you." Believe it or not, we still have pilots who become disoriented and need some assistance from radar to find the field, or need a reminder about the gear. We usually hear about these secondhand but we know they do happen. How about letting us know about these unsung "saves" so we can give a well-deserved pat on the back.

WEATHER CROSS TELL: One of the most reliable bits of weather information is one we call PIREP. When you ask about a destination and the forecaster has a current report such as this we tend to listen because we know that this is a personal evaluation by another pilot. Now, that the bad weather is here make sure that you keep the next guy in mind and give the forecaster a good analysis of what you have experienced. It's a big help. If you take the time to do this maybe everybody will get on the band wagon.



HOW TIGHT?

How tight is too tight? How right is about right? How important is all of this to you?

It ought to be darned important! Because the Air Force lost a bundle last year due to over- and under-torquing of assorted bolts, B-nuts and other hardware. Take a look:

In FY72, *as a direct result of improper torquing procedures,* six people died; one man was seriously injured; one aircraft was destroyed; two more aircraft suffered major damage; and more than 70 almost-accidents were reported!

These losses are inexcusable. Even if the aircraft were expendable (and they were not), the people inside them certainly weren't. So, since it *is* an important subject, let's talk torque.

When a common wrench is used to tighten a nut, it acts only as a lever to multiply the force exerted. There is no way *anyone* can accurately guess the amount of force placed on the nut. However, by using a torque wrench correctly, the amount of force applied can be measured.

We know that if a one-pound weight is hung on the end of a light steel bar which is supported at the other end, the bar will bend a slight amount. If the weight is doubled the bend of the bar will be doubled. If the weight stays the same but the length of the bar is doubled, the amount of deflection will again be doubled.

All torque wrenches use this principle. They differ only in the way the manufacturer has designed around the principle.

WHY MEASURE TORQUE AT ALL?

Simply this: As modern machinery gets more complex it is designed to narrower and narrower tolerances. There is no room in a modern fighter aircraft, for example, for any component which is too weak *or* too strong. A weak component is subject to failure: a too-strong component, as a rule, is too heavy. The modern machine is a carefully-engineered whole which is the product of carefully-engineered parts.

The parts are frequently held together by fasteners, and many fas-

teners have one thing in common: SCREW THREADS. And a threaded fastener is always designed to be tightened.

The question is, HOW MUCH? A bolt which is *under*torqued will be subject to cyclic stress (which torquing is designed to relieve) and thus becomes subject to failure; *over*torquing a bolt may increase tension to the point where the bolt fails and no longer carries its share of the load—and this, in turn, subjects adjacent fasteners to increased likelihood of failure.

The first step in finding out how much torque should be applied to a nut, bolt or fitting is to check the Dash Two for the aircraft/system you're working on. More and more, the Dash Two series is becoming increasingly explicit concerning the tightening of specific hardware. If the torque requirement for the particular fitting isn't covered in the appropriate Dash Two, the next step is to check TO 1-1A-8, which gives torque values for general hardware. *The Dash Two is primary, but if the values aren't given in the Dash Two, it is assumed that those in the Dash Eight apply.*

Once you know how much to tighten a piece of hardware, the next step is to select the best tool for the job. It's obvious that the wrench selected must fit the nut to be tightened, and that there must be ample clearance to turn the wrench, but there's more to it than that.

Each torque wrench is designed to measure torque value, but only within certain limits. These limits are known as the RANGE of the wrench.

Most torque wrenches are not as accurate on the extreme ends of the range as they are in the middle of the range. A pretty safe general rule to follow is this: pick a wrench where the torque value you want to measure is about the ¾ point of the range. For example, if you want to measure 750 inch/pounds of torque, a wrench with a range of 0 to 1000 inch/pounds would be a good choice.

Next, check the wrench for calibration. A torque wrench is a precision instrument and, like most precision tools, is quite sensitive to mishandling. Rough use, improper storage or even long periods of disuse can affect the calibration. To be sure your torque reading is accurate, make sure your wrench has been recently calibrated. All maintenance activities are required to have a system to check all torque wrenches periodically, in accordance with TO 32B14-3-1-101.



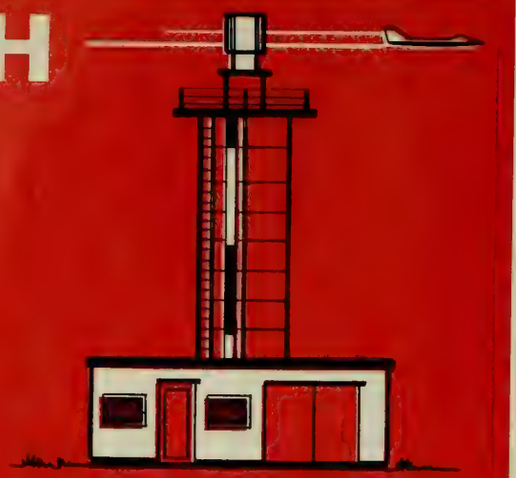
The manner in which a torque wrench is used often affects the torque reading obtained. The wrench should be turned only with a slow, regular, steady push or pull. A quick, rapid or jerky movement will always give jumpy readings which are not likely to be accurate.

Dirt, chips or damaged threads will also affect torque readings. Where possible, it's a good idea to replace all damaged threaded parts and to clean all threads before torquing. Generally, torque values are specified with the threads clean and dry (although in some cases the threads must be lubricated). Either way, if the thread condition is not correct, the torque reading will be wrong. It is good practice, especially when torquing new hardware, to first tighten the hardware to the desired torque value, back off approximately one-half turn, then retorque to the prescribed limit. This aids in cleaning and smoothing the threads and results in more accurate torque application.

It isn't always possible to torque the nut end of the fastener. Where the bolt head must be turned, the bolt shank friction should be considered. Torquing to the high limit of the specified range will generally take care of this.

Handle the torque wrench like the precision instrument it is. When you are through using it, return it to the point of issue for inspection, test and recalibration if necessary, and safe storage. The next time you or someone else wants to use it, it will be ready for use—and it will be correct and reliable. ★

WHICH WAY DID HE GO?



As you read this story you are sure to say "Did that really happen?" or "Is this a reprint from a 1948 issue?"

With our assurance that it is both modern and true, read on!

The story begins with a flight of two, planning a recovery at *Somewhere* Air Base, where poor, but not really bad weather prevailed—scattered at 500 and 1200 feet, and a 3000 foot ceiling, with 5 to 6 miles visibility. Sounds like a no-sweat situation. The flight leader asked for a radar approach, which was denied due to congested traffic. There is some debate about how congested it *really* was, but it was congestion that led the flight leader to decide on a TACAN-assisted VFR approach.

Though it may be hard to find such a procedure listed in the Air Traffic Control manuals, it might have worked—except that the *wrong* TACAN station was tuned! As a result, the approach was made to *Elsewhere* Air Base, one of the busier airdromes of the world, where the weather was decidedly worse—4/8 at 500 feet, ceiling 1200, visibility 1 mile in heavy rain!

The weather may have been even worse during the TACAN-assisted VFR approach, because the wingman lost sight of lead while in the clouds at 300 to 400 feet.

The flight leader landed safely, but not so Number 2. When he lost visual on lead, he made a go around, and a bad situation became decidedly worse. His TACAN didn't work. He didn't know where he was. He asked for radar assistance, but no one could pick up his beacon. (He apparently failed to turn on his Mode III Selector Switch.) With less than 10 minutes fuel remaining, he was lost.

At this point a phenomenon we've all "heard" about came into play. He sighted a runway through a break in the clouds, which looked to be about 4500 feet long. It looked that long only because it was extremely narrow—60 feet! !

He decided that the best course of action was to land with an alternative of flame out and ejection. The approach was good and touchdown was on speed, but the runway was actually only 2900 feet long!

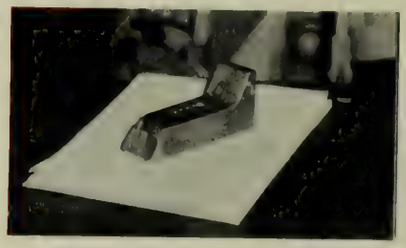
The resulting damage will be repairable, though the work and parts will cost nearly a million dollars. No one was seriously injured! The crew—and all of us—lived to learn from their mistakes. And there *are* things to learn! Traffic control, flight supervision, crew coordination, equipment use, visual reliability!

No, this isn't a hairy tale from the past—it just sounds that way! ! ★

control tools... fight FOD

It was a routine, night shift operational check of the engines on a C-5. Engine specialists performed a walkaround and verified that the intake inspection was signed off. Everything appeared normal.

All four engines were started and held at idle while checklist items were completed, then power was advanced. After about 10 minutes it was necessary to return to idle power while a specialist trouble shot a wing overheat condition. That

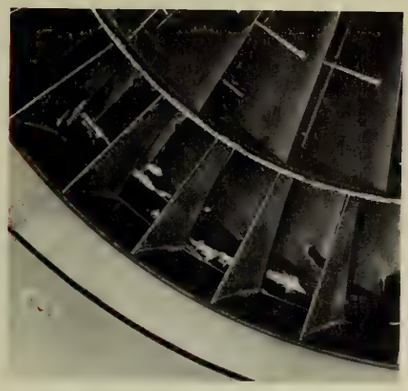


job completed, the crew again advanced power on all four. Suddenly there was a loud thump followed by severe vibration. The engines were shut down and MADAR indicated the trouble in Nr. 3.

Thus alerted, it didn't take the engine crew long to locate the 5-inch bucking bar that had been left in the intake and sucked into the fan.

Some detective work then revealed several discrepancies that added up to sure trouble. Our story really began several days before this event when some rivets were replaced in the Nr. 3 engine cowling.

The bucking bar might have been found if the job had been entered as a Red Cross, as required, instead of as a Red diagonal. The Red Cross would have required a supervisory inspection. The Red diagonal didn't.



Furthermore, the rivet repairman did not use a tool inventory checklist.

Finally, the FOD inspection just prior to the engine run apparently was not very thorough. ★

it shouldn't take an accident

The time: night. The place: a rainy part of the world. The situation: the F-4 was returning from a night combat mission.

The pilot returned to home base via radar vectors to a GCA final—everything ops normal. Touchdown occurred at 160 knots, 1000-1300 feet down the runway. The pilot deployed the drag chute and let the aircraft roll out on centerline, engaging nosewheel steering at 100-110 knots. As the airspeed bled off through 80 knots, he began applying brakes; at this point there were 2000-3000 feet of runway remaining.

At 20-30 knots everything appeared normal—the aircraft was still on centerline—and the pilot turned off the anti-skid. The aircraft began a slight drift to the left. The pilot reapplied brakes evenly and attempted to correct the drift with nosewheel steering. The drift continued. After approximately 280 feet the aircraft departed the left side of the runway—180 degrees from runway heading. The right main gear collapsed, damaging the right main spar.

Ouch! That hurt! ! Everything going so well, and all of a sudden we have a major accident on our hands! ! ! What in the world went wrong? ? ?

Well, a lot of little things went wrong:

• The pilot was very slow about starting braking action. In fact, he waited until he'd arrived at the very slickest part of a wet runway—the last 2000 feet, where rubber deposits are thickest.

• The pilot didn't bother following Dash-One procedures for landing on a wet runway. He didn't maintain full aft stick (in fact, he didn't maintain *any* aft stick) during any part of the landing roll.

• The guy in back didn't help much. He might have been calling off airspeeds during the landing roll to help the pilot better gage his deceleration.

• The 4000-feet-remaining and 3000-feet-remaining markers were missing. There has since been a hazard report submitted on their absence and, presumably, corrective action has been taken. But a hazard report submitted before the accident might have prevented it.

• The pilot had just returned from the second of two back-to-back night/weather/combat sorties, and there's no doubt that he was tired. Perhaps that kind of scheduling is necessary. But perhaps not, and supervisors should be constantly aware of the invitation to an accident represented by aircrew fatigue.

• The main tires were mismatched. The right main was a four-groove and the left main a three-groove. Studies in the past have indicated that four-groove tires are much more resistant to hydroplaning than are three-groove tires, and that directional control is degraded when tires are mismatched. On-going studies are expected to confirm this. In the meantime, if we must use three-groove tires, *both* tires should be three-groove.

• The base at which this occurred has doubled the frequency of cleaning the rubber deposits off the runway; deposits are cleared quarterly instead of semi-annually. Other units should analyze their incidents of hydroplaning to assure current practices are sufficient. *It shouldn't take an accident* to provide a clue. ★

THE AIRFRAME

The following story offers a good example of the way a concern for safety, coupled with an inventive mind, can lead to a better, more efficient operation. New and better solutions are constantly being found for the problems which plague us all; it is extremely important that each one be carefully evaluated, properly engineered and—once that is accomplished—ADVERTISED so that everyone can benefit.

"Sir, one of our cross-country F-5's is grounded for a gearbox change. The base has no AGE gear to do the job." The Chief of Maintenance has heard this story many times. He leans back and asks the Maintenance Control Chief if he has any ideas. He says, "Yes, sir, our people have made a pad (Figure 1) to take the place of the adapter shown in T.O. 1F-5A-2-2. If the base had a jack that would work on it, we'd be in business, but they don't." So the Chief of Maintenance concludes that with help from the transient crew our mechanic can manhandle the gear box change. The job gets done while the Chief of Maintenance worries about the safety of it. The bird gets back and all is well.



Figure 1. Generator Pad for Use on Standard Jack.

About two or three weeks later, the same mechanic walks into the office of the Chief of Maintenance carrying a survival kit container. He opens the lid and says, "Sir, I'd like you to consider a safer way to change a gearbox when we don't have the authorized AGE gear and sometimes not any help." The mechanic picks up the canvas bag from the container, zips it open, and proceeds to build up a flyaway gearbox adapter—jack, plate, base on rollers—the whole works! He says, "Sir, we can stow this as you saw and fly it anywhere. We can remove and replace the gearbox with one man and it's safe!" The Chief asks about the strength of the base. The mechanic says, "I don't know sir, but since it's quarter-inch aluminum plate, it does the job and is light for the flyaway kit."

The assembly continues by the mechanic taking an ordinary automobile bumper jack base out of the bag and bolting it in the center of the baseplate, using four quarter-inch 28-thread screws long enough to secure it. The mechanic took the jack shaft. The Chief of Maintenance says, "What did you do to that?" (seeing it was modified by shortening and welding a guide on one end). The mechanic responded with, "Well, sir, it was too long, so we cut it off and welded the guide on the end that wasn't made to fit in the jack base. This guide is for guiding the main cylinder tubing."

The mechanic installed the jack mechanism on the jack shaft and installed the jack shaft in the jack base. The jack mechanism has a cup-shaped fitting welded to the top of it through which the jack shaft runs. The Chief wanted to know why it was threaded. The mechanic explained, "Sir, I used an old T-33 canopy remover cartridge for the main cylinder, but any tube would work. It doesn't have to be threaded as long as it fits snugly in the bottom cap and the guide fits snugly in the tube." He screwed in the adaptor and said, "We threaded this, too, because it was handy. It needs to be attached to the main cylinder in a firm manner so the unit is stable when supporting the gearbox." The mechanic took the extension out, inserted it into the adapter, and pinned the inner tube with a steel pin. He inserted the shaft of the upper plate assembly into the extension and said, "That's it, sir; let's take the gearbox out."

The Chief of Maintenance noticed he did the whole job with one No. 10 Torq-set screwdriver. He said, "Looks good and feels sturdy—how long does it take you to assemble it when I'm not bothering you?" The mechanic said, "About 10 minutes, sir."

They rolled the unit under the F-5, jacked it up to position, and Airloc fastened the upper plate to the cross members of the gear box. The gearbox removal was completed, the unit was jacked down and rolled out. The mechanic said, "There you are, sir."

This story depicts the conditions surrounding the solution of a real problem. Ingenuity on the part of Mr. Farrel F. Stiles, Vance AFB, and an interested Chief of Maintenance are the ingredients of that solution. See photos on page 17.

Units interested in locally producing this item should consult AFM 66-1, Vol II, para 2-117 and 2-118, which covers the local manufacture of nonstandard or specially designed tools.—Ed.

—F-5 Service News
Northrop Corporation

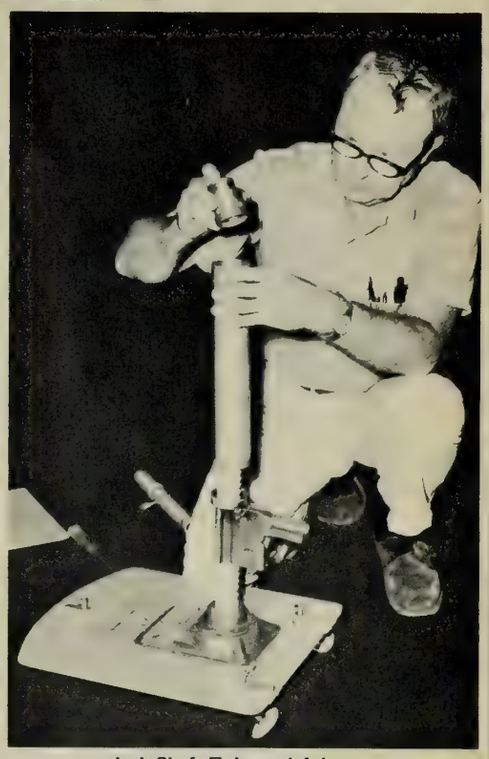
GEARBOX DILEMMA



Pieces Unstowed.



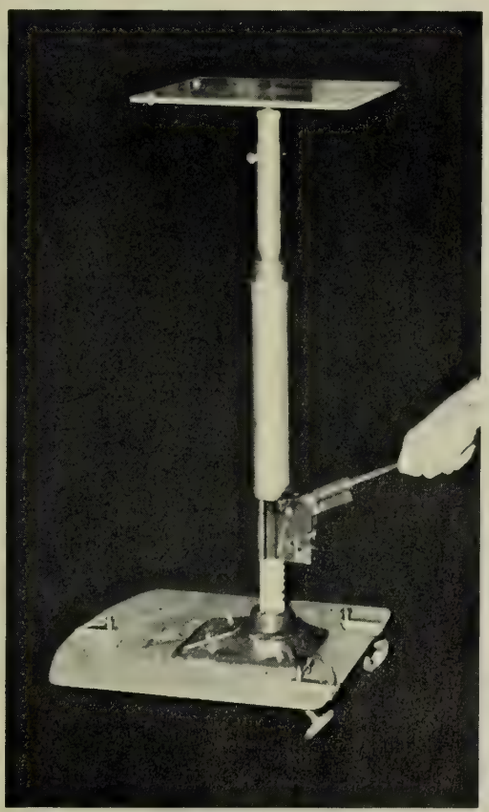
Base Plate and Jack Base.



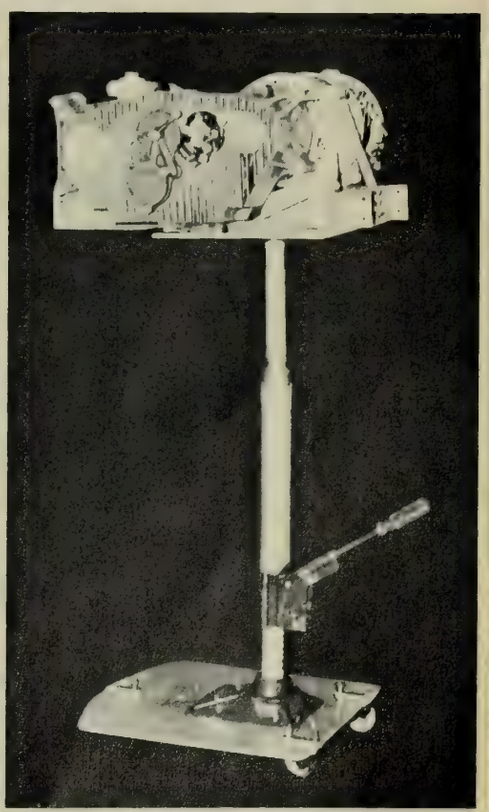
Jack Shaft Tube and Adapter.



Extension and Upper Plate Assembly.



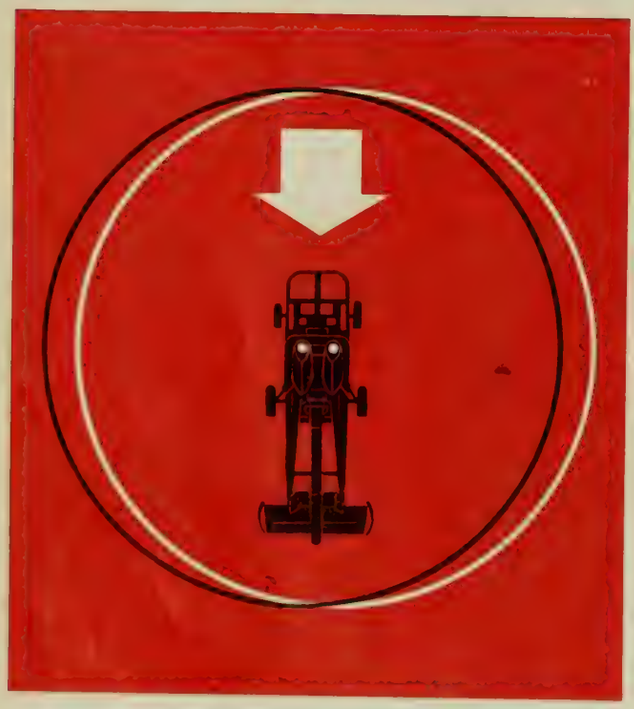
Assembled for Use.



Gearbox Loaded.

OPS TOPICS

approach pedro from the front



A USAF HH-43B "Husky" was scrambled recently to pick up a pilot who had successfully ejected from his crippled airplane. The downed pilot was located in a heavily timbered area, but the pilot of the helicopter was able to locate a clear area nearby. The spot selected was surrounded by trees, but sufficient clearance existed to allow a safe landing.

As the rescue pilot initiated the landing, the downed pilot ran toward the front of the helicopter—which is the recommended approach path for the HH-43. But just as the helicopter was touching down, the downed pilot suddenly changed his approach direction and started to enter from the right side.

To prevent injury to the man on the ground, the helicopter pilot immediately brought the aircraft to a hover, turning 45 degrees right for added clearance. As he did so, the left hand blades made contact with branches of a tree, seriously damaging both left hand blades. Fortunately, the pilot was able to accomplish a landing and a normal shutdown; there were no injuries.

"Pedro," "Husky," HH-43B—whatever you call it, it is used worldwide as a rescue helicopter. Everyone who might have occasion to be a guest on one—and that means you!—should be aware of the proper approach zone. Fortunately it's easy to remember—because there's only one. Check the accompanying illustration.

cleared visual approach

Recently one of our newest tactical aircraft was returning to base following a night VFR training mission. Destination weather was good, although isolated patches of blowing dust existed in the area due to high winds. Approach Control sequenced the aircraft for a visual approach behind other traffic and released him to Tower at a VFR fix several miles southwest of the field. The tower controller acknowledged the pilot's report over the fix and cleared him for a straight-in approach with a request to report on final.

Shortly thereafter, the pilot reported on final for a full stop. Tower issued a gear check, winds, landing clearance and advised the pilot he was not in sight.

A rapid visual search by the tower crew finally spotted the aircraft—descending smartly and lined up with a highway a mile or two away from and parallel to the runway! Tower advised an immediate go-around, and the pilot quickly complied. An increase of runway lights intensity solved the immediate problem, and the landing was accomplished without further incident.

The use of visual approaches and vectors from either Stage II or Stage III radar service is a valuable tool for expediting the flow of traffic in terminal areas. However, good operating practices require pilots to keep themselves oriented with respect to the landing runway by using all available NAVAIDS. This is particularly important when operating in high density areas, into unfamiliar airfields and during periods of reduced visibility.

—AFCS

where'd that tree come from?

The weather wasn't really good enough for a flyby, but it was forecast to improve, so the nine aircraft launched IFR (in two-mile visibility) to hold VFR on top and await their cue.

While descending from the holding pattern to 1000 AGL, the number three element leader lost sight of the leading elements. He continued to descend anyway, and entered a low cloud deck.

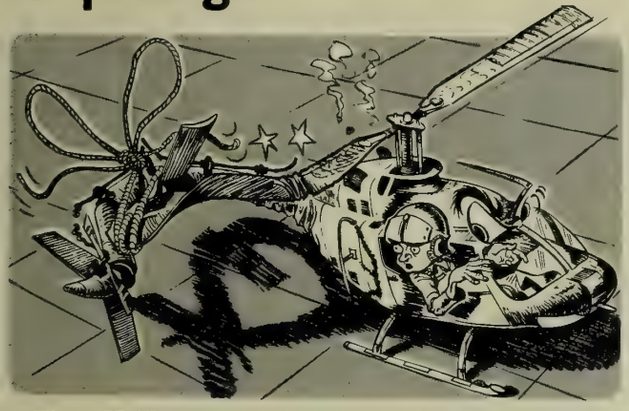
He suddenly realized he was too low, and called for the flight to pull up. The flight rejoined on top and went on about their business, rejoining the formation and completing the flyby.

It wasn't until the maintenance postflight that they discovered that the right wing man's aircraft had sustained minor damage from hitting a tree.

Shudder! ! !

That must have been a darned important flyby—important enough to launch in the face of weather below AFR 60-6 criteria—and important enough to divert the element leader's attention from the task at hand: keeping himself and his wingman healthy!

a normal mission— to preflight



The UH-1P preflight checklist requirements are brief and simple. There are only three major areas: the first is "Tiedown—REMOVED". Recently a Huey driver attempted to get into the blue without taking care of that little item. Needless to say, he failed.

To paraphrase the incident report, "The pilot was making a *normal* preflight in preparation for a range support mission. As he approached the tail boom, his preflight was diverted to check the loading. He then resumed and completed the preflight, but without noticing the rotor tiedown strap still securing the tail rotor to the aft-positioned main rotor blade. An engine start was subsequently initiated with the blades tied down, but discontinued when the pilot noted the main rotor was not turning. As the throttle was closed, the tiedown strap broke and the main rotor made two revolutions, during which the tail rotor blades contacted the drive shaft housing."

It is hard to visualize how a major and obvious discrepancy such as this could be overlooked during even a cursory preflight. There are many lessons implicit in this incident, the most obvious being—follow the checklist and do not interrupt the sequence.

FLIP CHANGES

FSS Radio Frequencies: To reduce frequency congestion and its related problems of interference within the FSS system, the use of standard VHF frequencies at FSS's has been discontinued. FSS UHF frequencies are not affected. Each FSS will now have available one or two enroute VHF frequencies, each protected for the service volume of the facility. In addition, 122.2 will be available at all FSS's to provide a common enroute frequency. The Enroute Low Altitude Charts will be revised to eliminate the shadow box which is now used to indicate the availability of standard FSS frequencies. In place of the shadow box, the frequencies available at that site will be listed above the NAVAID identification box. FSS's designated as Enroute Weather Advisory Service (EWAS) stations are indicated by two solid triangles within the top corners of the identification box. The EWAS frequency 122.0 is common throughout and will be identified in the legend only.

fooled ya!

The mission was barely airborne when the KC-135 was diverted into a different airfield to pick up another crew. GCA to the runway was routine; VASI confirmed a good glide path, with 400-500 fpm rate of descent. Unfortunately, the aircraft contacted the runway without any appreciable arresting of the descent, and bounced back into the air. The second and final touchdown was a four-pointer—the right main and nose gear, and numbers 3 and 4 engines.

The runway was about one-third narrower than the ones the pilot was used to. The IP on board (but not at the controls) was so concerned that he briefed the pilot on possible perceptual errors prior to the approach. Apparently the briefing wasn't enough, for the pilot still failed to perceive the proper point at which to arrest the descent. (He also used improper procedures while recovering from the bounce.)

The IP had not familiarized himself with the pilot's recent experience. The pilot had received his aircraft commander checkout, then flown right seat missions for about six weeks before going on leave. This was his first mission after ten days of leave and his initial "operational" mission as aircraft commander. Had the IP considered this, he most likely would have occupied the right seat for the approach and landing—just in case.

Prudence somewhere along the line would surely have nipped this blossoming accident in the bud.

weather advisories

For all the jawing that's done about it, there's still an apparent misconception among pilots regarding the responsibilities and capabilities of Air Traffic Controllers, particularly when the pilot is trying to navigate in and around weather buildups.

For the record: The Controller can't "see" lightning, turbulence and most other weather. All the radar will pick up is precipitation, and if the Controller is using the circular polarization function on his scope, he won't pick up the precip either.

Further: The Controller's primary job is traffic separation *between IFR aircraft*. Anything else falls into the nice-to-have category, depending on the Controller's workload.

Now, let's say you're in and among the thunderbumpers—we won't ask how you happened to get there—and you want some help getting out. Can you get it? Sure—unless you're in the middle of the Chicago-O'Hare TCA or fifteen other guys have made the same mistake.

The point is: Air Traffic Controllers are justifiably proud of the service they render. As a matter of course, they do far more than the minimum required. But weather avoidance *is* an extra, and advisories may not be available under certain conditions. The best advisory is not to get into anything you can't get out of.

keep it up

While most USAF flights are conducted under IFR, there is still a small coterie of VF and R pilots in our group who should be interested in FAA's recently-adopted "High Flyer" program. The idea is to keep the noise to ourselves, and there are three basic operating rules:

- Pilots operating aircraft over outdoor assemblies of persons, recreational and park areas, churches, hospitals, schools, wildlife areas and other such noise sensitive areas should fly at least 2000 feet above the surface, weather permitting, even though flight at a lower level may be "legal."
- Circumventing noise-sensitive areas is preferable to flying over them at low altitude.
- Climb after takeoff and descent for landing should be made so as to avoid prolonged flight at low altitude.

Of course, these procedures in no way conflict with such things as ATC instructions or other situations in which safety of flight might be compromised.

checklist ignorance

The F-4 was at another base for Mod when the ten-day parachute inspection came due. While inspecting the back seat, the technician discovered that the parachute safety pin lanyard was not routed through the alignment ring. Searching further, he found that the safety pin was installed backwards and not safetied. The important factor here is that if some backseater had had occasion to use the chute, he would have been sorely disappointed.

The F-4 is unique in one respect: there is a rather comprehensive preflight inspection of the ejection system required of the aircrew—step-by-step procedures are contained in the aircrew checklist.

Also unusual is the frequency of inspection by the Life Support section—a ten-day interval.

In this case, the misrigged parachute had been missed on no fewer than *five* successive ten-day inspections AND on every aircrew preflight over a two-month period. As an example of across-the-board lack of checklist discipline, that's hard to beat. ★



LT COL RICHARD H. WOOD, Directorate of Aerospace Safety

In June of 1972, we published an article by Mr. George E. Kammerer of SMAMA titled, "IRAN versus IRAP." The substance of the article was that the term IRAN (Inspect and Repair as Necessary) is misleading in that we don't do that anymore. We program our depot-level maintenance around what needs to be done and those who do not understand this concept are in for a career's worth of temper tantrums and high blood pressure.

The article generated a few letters and comments and it became apparent that there is still plenty of room for discussion of IRAN—what it is and what it is not.

We at the Directorate of Aerospace Safety are in no position to jump into the depot-level maintenance business and argue specifics, but we do see several areas that are contributing to misunderstandings and ill feelings.

First, the term "IRAN" has officially been changed to "PDM," Programmed Depot Maintenance. Those of us who still think the phonetic alphabet begins with Able, Baker, and Charlie will probably continue to call it IRAN for a generation or two, but we should at least acknowledge the change in definition.

Next, the annual Maintenance Manager Review (MMR) for each weapon system has not, in all cases, received the attention it deserves. Aside from being a technical review of maintenance techniques, it is also where AFLC and the senior maintenance managers of the using commands are supposed to get together and assess depot-level maintenance requirements. Here, AFLC will present its proposed PDM plan and discuss such determinants as the Analytical Condition Inspection (ACI) Program, the Aircraft Structural Integrity Program (ASIP), and other data sources. Presumably, the commands point out other work that is essential, but beyond the commands' resources, and work that can best be done concurrently with the PDM when the bird is opened up. Hopefully, everyone comes to some sort of agreement on PDM and AFLC develops its PDM work package on that basis. If the using commands didn't make their position known at the MMR, the score is AFLC 4, visitors, 0. (5 - 0 is a skunk and the game is over.)

Finally, the importance of the PDM work package itself gets overlooked. Frequently, we find that the firm published work package is not available at the local level where the planes are. As a result, the locals can't possibly do a good job of notifying the depot of specific conditions on specific aircraft which are outside of the work package (AFTO Form 103); nor can they reasonably evaluate the depot's work (AFTO Form 64) when they get the plane back. Small wonder that the mere mention of IRAN—oops—PDM tends to raise blood pressure and melt earwax.

"Yeah," you say, "that may be the way things look from up there in the ivory tower, but that's not the way they are in the real world where we have real airplanes and real people!"

We know, we know, we know. The whole problem of depot maintenance is far more complex than we've described here, and the procedures for some weapon systems don't seem to fit anything we've said so far.

Help is on the way. The recent Air Force-wide LGM conference was helpful in thrashing out these problems and revised directives are now in coordination. If it's not too late, you can cancel your correspondence course in clairvoyance, because the PDM work package should no longer be a surprise to anybody. ★



Tech topics

wrong fuel

How much JP-4 pumped into an avgas burning O-2 would it take to cause problems? Any amount would be too much.

After all that has been said and the precautions that have been taken, one would think it would be impossible to pump the wrong fuel into any bird, but it has happened again. In fact, it happened to two O-2s in the same outfit.

The crew chief was preparing to refuel the O-2s but the normal avgas tank was empty so he called for a truck. Not noticing the JP-4 markings on the truck, he serviced the two aircraft.

Next morning when the aircraft were prepared for flight, the crew chief did not notice any abnormalities during fuel sampling. The pilot arrived and after strapping in, could not get the engine started. He aborted the first aircraft and proceeded with the second. This one started okay but during runup at the runway, the front engine was erratic at 2300 rpm. The pilot aborted and the mixed fuel was discovered.

Both the pilot and crew chief were cited for not detecting the mixed fuel during their preflight.

To go a bit further—some responsibility should be placed on POL and the flightline supervisor. POL supervision was deficient in allowing a JP-4 truck to be dispatched to an O-2 aircraft, and flightline supervision was deficient in not detecting the JP-4 truck.

garbage can

During pre-taxi checks of an F-105, control stick movement was limited to two inches left of neutral. The crew chief reported the left aileron full down with the right streamlined. The mission was aborted and the bird turned back to maintenance.

During troubleshooting, when panel W-7 was removed to inspect the aileron components, 17 Jo bolt stems were found, one of which was lodged in the control end of the actuator restricting its movement.

Review of the aircraft records indicated previous replacement of nine Jo bolts in this area.

As a result of this incident, the unit decided to take a look at more assigned aircraft. Inspection of 15 aircraft revealed seven with foreign objects in the same area. The debris ranged from one rivet to 19 separate items, including nuts, washers, broken clamps, even a rubber bulkhead cable guide. That bird was a real garbage can.

How about your aircraft? Are they FOF (foreign object free)? Would you stake your life on it? The pilot does each time he straps in!

crossed wires

Approximately three minutes after takeoff the Nr 4 **generator-out** light came on. The generator was turned off, and it was noted that both voltage and frequency inputs monitored zero. Attempts to reset the generator were unsuccessful. The Nr 4 disconnect switch was actuated and a few seconds later Nr 3 **generator-out** light and Nr 3 **disconnect-fired** light came on. No further attempts were made to disconnect Nr 4 generator. The mission was aborted and the C-130 returned to base.

Maintenance found the wires crossed: The Nr 3 generator disconnect wire was connected to Nr 4 switch, and, of course, Nr 4 to Nr 3. The place and individual who performed this incorrect wiring job could not be determined, but one thing is sure—whoever he was, he didn't follow the TO.

improper installation

A C-131 was cruising at 11,000 feet when the pilot noticed something move outside the pilot's window. Shortly thereafter the rank holder fell off the aircraft.

Improper installation was the cause. Although the C-131 series TO does not give instructions for installation of the rank holder, TO 1-1A-8 describes the proper method for installing cherry rivets which were used during this installation.

Lesson: if the specific aircraft tech order does not cover the job, consult the general tech order.

the goon deserves better

The Goony Bird, as old as it is, still shows up in the incident reports. Here's a maintenance goof that never should have happened.

Just after takeoff the cockpit filled with smoke and the flight mechanic reported heavy smoke and flames coming from number two engine cowl flap area. A closed pattern was flown and single engine landing accomplished.

The cause: the cowl flap actuator had been installed upside-down. This allowed the hydraulic line to be rubbed by the cowl flap. The line wore through and hydraulic fluid sprayed on the hot exhaust. During inspection of other aircraft in this unit three additional actuators were found installed upside-down. There must be a guy named Murphy working in this outfit.

inspect the work

As the C-141 passed through approximately 1000 feet on takeoff, the number two emergency escape hatch departed and cabin pressure was lost. The mission was aborted. It didn't take long to discover why the hatch departed. The hinge pin had been left out during prior maintenance. Even though an entry had been cleared in the 781 concerning the hatch, the inspector failed to detect the missing hinge pin.

TO 00-20-1 clearly states that the use of a red x symbol has been established to insure **inspection of the work performed.** In other words, just signing the forms won't hack it. The inspector is directed by tech data to conduct a complete and thorough inspection which includes all access panels which have been removed to perform maintenance.

murphy strikes again

Transient Alert Section had borrowed an MC-1 compressor from the base shops to service a tire on a visiting Talon. The low pressure air chuck had been accidentally attached to the high pressure air hose. The air chuck was connected to the T-38A main landing gear tire and the low air pressure gage was set at 185 psi. Failing to obtain any air pressure from the low pressure regulator, the technician opened the high pressure valve.

The servicing of the T-38 tire with the high pressure air resulted in the tire and wheel being blown from the axle. Disintegrating parts severely damaged the main landing gear door, brake assembly, and strut door. Nearly 30 man-hours were required to replace the damaged parts. Fortunately, no one was injured.

The availability of high pressure air and its inadvertent use in low pressure air systems is a continuing problem. The very nature of working around lethal equipment on the flight line provides a fertile ground for gruesome accidents. Add complacency or unfamiliarity to this environment, and you have the vital ingredients which can wreck the best planned safety program.

(Northrop Talon Service News)

$142,411.00 pair of pliers

A J-75 engine was delivered to the test cell following maintenance. The inlet covers were removed, inlet inspection completed and covers reinstalled. The engine was placed on the test cell and prepared for run. Again the inlet cover was removed and the inlet inspected. The bellmouth screen was installed and the engine started. It was run up to military power twice for trim adjustments, then a third runup was made for final test readings. After about two minutes of the final run, sparks were seen coming from the compressor bleed ports. The engine was shut down.

A pair of needle nose pliers had been left in the bellmouth area and was ingested by the engine.

finish the job

When power was applied, during preflight of a C-130, the Nr 3 nacelle overheat light came on. Maintenance soon found the problem: Water in a cannon plug in the engine compartment. After the water was drained and the cannon plug dried, the system operationally checked okay, preflight was completed and the bird released for flight.

Just after liftoff, as the gear was retracting, the Nr 3 nacelle overheat light came on again. The engine was shut down and the light went out. Return to base was uneventful.

Maintenance went back to work on the system and completed the job they had started during the earlier troubleshooting. **They cleaned the rust from the cannon plug.** Had these troops cleaned the plug after it was dried, this inflight abort would have been prevented.

Tech topics

murphy at work

After takeoff, when "gear up" was selected, the right main and nose gear of the F-4D failed to go to the up and locked position. When the gear selector was placed down, the right main and nose still indicated unsafe and utility pressure was zero. Emergency extension was selected and all three showed down and locked. Fuel was dumped, the flaps blown down and an approach end barrier engagement successfully accomplished.

Maintenance found that the right inboard gear door and linkage assembly had come in contact with the inboard door hydraulic actuator line during retraction, which caused the line to fail, depleting the utility system.

Examination of the line revealed a true Murphy.

The line installation is such that access to the DZUZ fastener that secures the refueling control panel is limited. Photo Nr 1 shows the correct way to disconnect the fastener, but, as you can see, this can be a "knuckle buster". Photo Nr 2 shows the more common method of gaining access to the DZUZ. This method is easier on the knuckles but tends to reform the line to a forward position after a period of time. Repeated binding of the line can also lead to looseness of the B nut.

Photo Nr 3 shows the end result of bending the line. It will eventually come in contact with the inner door linkage, as was the case in this incident. Photo Nr 4 shows the normal undisturbed position of the line as the door closes.

The unit in which this incident occurred has recommended to the AMA that wing nut DZUZ fasteners replace the screw type on the refueling control panel.



Photo One



Photo Two

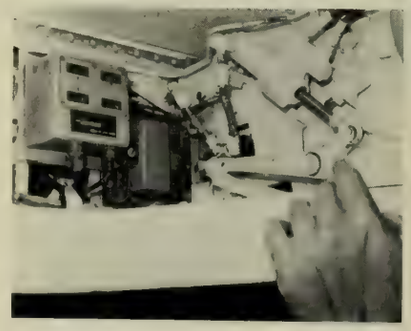


Photo Three



Photo Four

oops

Failure to comply with established directives has been the prime cause of many an accident and incident. Here's a recent example.

The load crew was dispatched to upload an F-4. Upon arrival at the aircraft they found it completely armed. They dearmed it but failed to remove the centerline cartridges. Then the jettison function test was started on the left outboard pylon. Everything progressed normally and both left pylon checks were completed. The crew moved to the centerline station. The crew chief pulled the safety pin, number three man connected the PSM-6, the signal was given that all was ready. **Number two man actuated the centerline jettison switch. The station jettisoned as designed.**

Compliance with each step of the checklist (which includes removal of all impulse cartridges) would have prevented this incident and a lot of red faces.

a classic example

A classic example of not documenting maintenance in the A/C forms comes to light in this incident.

The preflight, engine start and before taxi checks appeared normal. During initial taxi the chopper began veering to the right. Normal control inputs would not stop the turning movement. The aircraft was stopped and the right brake checked for possible dragging. The brake was found ok but the nose gear was cocked 90 degrees to the right. Suspecting that a cocked nose gear was causing the directional control problem the pilot proceeded to raise the nose gear off the ramp for re-centering. As cyclic and collective pitch were increased the aircraft rotated to the right and began a horizontal movement.

The chopper was placed firmly on the ramp and the engine shut down. During engine shut down the pilot discovered that he had no tail rotor control.

During investigation it was discovered that prior to this incident three automatic flight control specialists were dispatched to replace a trim sensor switch. After removing a bolt that connects the yaw servo to the tail rotor control rod the bolt was placed in a tool kit. At this time the specialist discovered that the yaw servo would have to be removed to replace the sensor. The maintenance superintendent made the decision to delay replacement of the sensor due to mission requirements. Neither the superintendent nor the crew chief was aware that the linkage bolt had been removed. The specialist forgot about the bolt (it had not been entered in the 781 as required by Tech Order) and buttoned up the bird.

TO 00-20-5, para 9-1 clearly describes the requirement for entering the Red X whenever maintenance is performed on aircraft flight controls.

The prime time to enter this Red X would be at the start of maintenance when the system is disturbed. (When the bolt was removed the Red X entry should have been made.)

age is important too

A KC-135 was in the hangar on jacks for a retraction test. After the test was completed and the crew was down jacking, the tail jack extension screw separated from the jack ram. This allowed the aircraft to rock back on its tail and strike a mechanic's tool kit. This was followed by a forward rocking motion but the forward right inboard jack missed the jack point and went through the wing skin. The stabilizer and number two engine cowl were also damaged during this movement.

Once the aircraft was safely on all three gear the investigation started. It didn't take long to determine that the extension screw stop was badly worn and the screw had been extended to the point where less than one thread was holding in the ram. This part of the thread failed during the down jacking. (The tech order limits extension of this screw to 15 inches.)

There are two lessons to be learned from this accident:

- Never extend the extension screw beyond TO limit—do not depend on the screw stop.
- Thorough and timely inspection and maintenance on all age equipment is essential.

no cotter pin

As the KC-135 was taxiing to the runway, number one engine flamed out. The aircraft was returned to the parking spot and turned over to maintenance.

It didn't take long to discover the problem once the cowling was open. The throttle to fuel control linkage was disconnected. The bolt that makes this connection had come out, allowing the linkage to separate and the fuel control to go to the cut off position.

This bolt is normally secured with a cotter pin, but no trace of the cotter pin could be found.

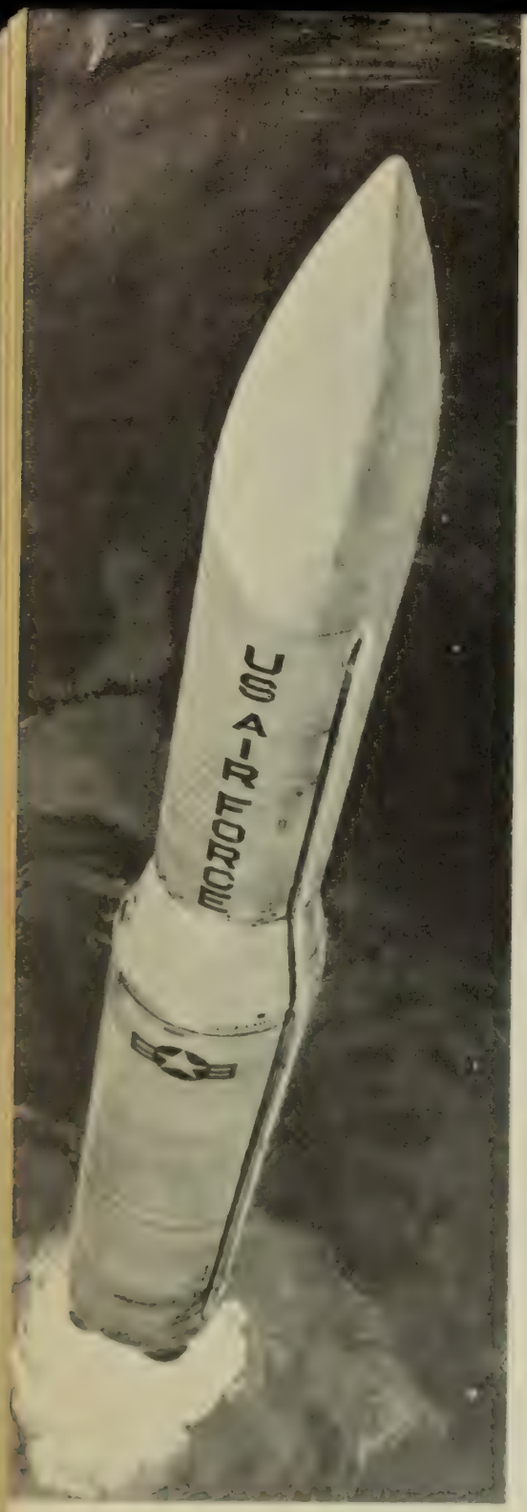
Suppose that this linkage had separated just after the bird became airborne. Things can get pretty hairy at this stage of flight when you suddenly lose an engine.

tech data slip

Sometimes the tech order doesn't give the mechanic all he needs to know to do a job. Tech Order 1T-38A-2-6 is a good example. It gives detailed information on removal and installation of the engine bay throttle cable quadrant assembly, but there are no specific instructions for disassembly or reassembly of the quadrant.

During maintenance on one bird, the quadrant pulleys were installed in reverse. In this reverse configuration, the throttle control cut off cam can only be installed backwards. With the cam in this position the 90-degree face of the cam will strike the throttle control fuel switch striker bolt, rather than the 32-degree angle face as designed. In this case rapid or firm movement of the throttle to the idle position will actuate the fuel flow control valve shutting off fuel to the engine.

When this was discovered, the unit immediately prepared an AFTO 22 and instructed every man working on this assembly on its proper maintenance. ★



MINUTEMAN "LEAKERS"

LT COL ROBERT E. WALKER, Directorate of Aerospace Safety

What happens when a Minuteman missile guidance and control (G&C) coolant system springs a leak? Two things of primary significance—loss of internal G&C cooling and corrosion damage to components. The leaks have been both internal (inside the G&C) and external (associated with the exterior "plumbing" of the cooling system).

Cooling is essential to the proper functioning of the interior electronic components in the guidance package which are in constant 24-hour operation on all alert ready Minuteman missiles. Loss of coolant leads to overheating and ultimately causes extensive damage to micro-miniature electronic components, requiring complex repair or complete replacement.

Loss of the component cooling function is not the only problem which develops as a result of a coolant leak. When liquid coolant (powdered sodium chromate mixed with water) escapes from the G&C cooling system and is exposed to the atmosphere it becomes highly corrosive. As a result, any cooling system leak can lead to substantial damage in the G&C unit, the missile, or any number of the many cable and accessory systems which make up the fully configured weapon system.

A NUMBER OF LEAKS have been caused by material deficiencies such as: a manufacturing flaw in the machinery of a plug used internally in the G&C; failure of an umbilical (connector which provides ground power and cooling to the missile) coolant port to automatically align during mating; failure of an epoxy seam in the computer case of the G&C.

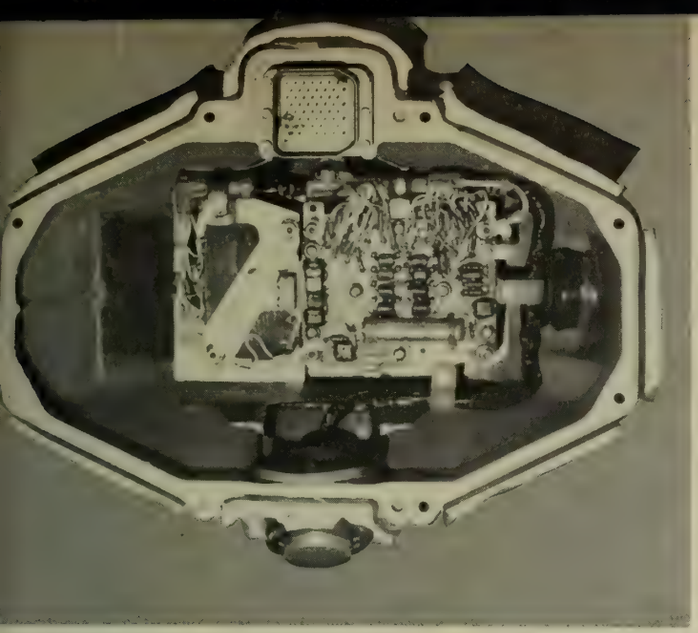
Still other leaks have been caused by personnel errors: failure to connect coolant lines prior to applying electrical power; mismating of the G&C umbilical connector to the guidance unit; failure to follow technical order procedures.

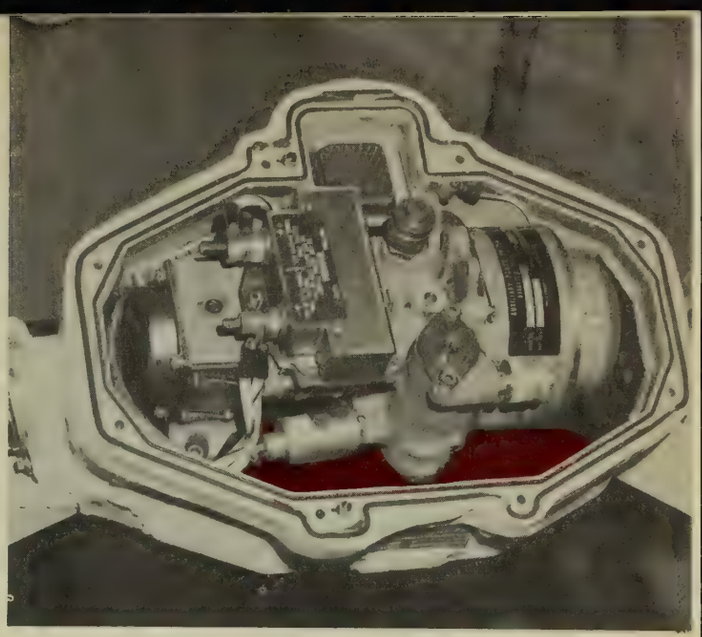
TO ISOLATE the materiel failures and reduce the potential for personnel error, Materiel Improvement Projects have been established and are being conducted by AFLC. In addition, new procedures and tests have been developed and implemented to aid in identifying leaks in their earliest stages. One of these procedures is accomplished by the specialized repair activity at Newark Air Force Station, as a portion of the final check-out for the guidance systems. The checkout involves pressurizing the internal coolant system using dry nitrogen to test its ability to retain pressure within specified limits. A similar type of test, to be accomplished at unit level, either at the launch facility or on the base, recently has been included in field level technical orders along with distribution of newly designed portable test equipment.

Along with these actions, increased attention and emphasis by maintenance technicians contribute to early identification of G&C leakers. For example:

By looking for tell-tale traces (greenish-yellow stains) of pooled or dry sodium chromate on the ground adjacent to the sump discharge pipe and in the drainage ditches at the LFs.

By being aware of which hoses contain sodium chromate and looking for leaks primarily at connectors





At left is a Minuteman Third Stage Nozzle Control Unit opened to expose the complexity of the internal components and circuitry so highly susceptible to sodium chromate damage. On the right is a Third Stage Nozzle Control Unit which was removed from an operational missile after a leak was discovered in the G&C cooling system. Sodium chromate is shown in red, although the substance actually is yellow.

for the chiller unit and storage tank(s).

Being suspicious of having to replenish the coolant storage tank with large quantities of coolant.

By inspecting the missile and G&C and looking for signs of coolant leakage (droplets, streams, or stains):

(1) Around the umbilical where it mates with the G&C.

(2) Around any vent holes on the missile.

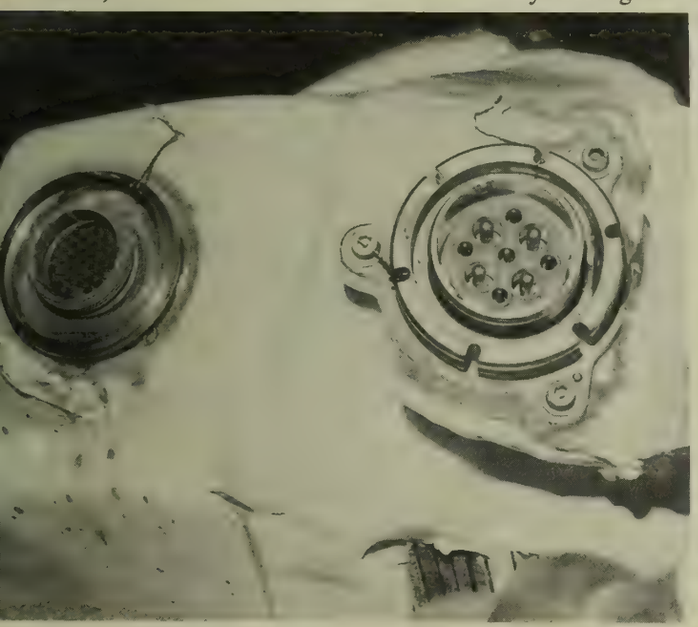
(3) At the interstages.

(4) At bolt holes where the G&C mates with the missile.

(5) Along the missile raceway.

By looking for deposits of wet or dried sodium chromate on the missile suspension system, on the floor, and in the sump at the bottom of the launch tube.

Early identification of a leaking G&C substantially limits the damage, reduces the manhours required for repair and assists specialists in isolating the faulty component. ★



Shown above are two male connectors on the outside of the Nozzle Control Unit which was removed from an operational missile. Note the obvious stains around the connector bases.



During initial inspection of a missile exposed to a leaking G&C cooling system, chromate is discovered at the base of the third stage. The coolant has seeped into the missile raceway and the cabling. Continuity checks will be performed on the cabling. Failure of the continuity check requires replacement of the entire cable.

KEEPING YOU HIGH



If you fly a turbojet aircraft, expect FAA to keep you high as long as possible when you enter a terminal area, and get you to altitude as soon as possible on departure. The primary reasons are safety and noise abatement.

These procedures resulted from the findings of an FAA near midair collision study in 1968. It showed that a high percentage of terminal near collisions occurred below 8,000 feet and within 30 miles of tower-controlled airports.

The procedures (CSAF/X00FA message, 282100Z Sep 72 and FAA Order 7110.22A, 28 Feb 72) are as follows:

- **Arrivals:** Enter terminal area at or above 10,000 feet, remaining there until 30 flight path miles from the touchdown point (if feasible).
- **Departures:** Use uninterrupted climbs to the extent possible. Avoid assigning altitudes below 5000 feet.
- **Visual Approaches:** Aircraft restricted to at least 5000 feet above airport elevation until entering descent area (approximately 20 miles from the end of the runway). ★

Like the knight of old who wanted a "horse I can ride," the first requirement of a pilot is an "airplane I can fly." By that we mean the bird should be in reasonably good shape, with no major squawks and capable of performing whatever is called for.

Usually our airplanes fit into this category but there are those times when one doesn't perform. Something fails within that intricate maze of wiring and plumbing, sheet metal, rubber, plastic, and the white hot heat of the engine, and we need those other items designed to get us safely to the ground, found and rescued, as the case may be. Consequently, we take a certain amount of interest in our survival equipment and are quite vociferous about any inadequacies that come to light during the moment of truth.

Hence this report on some survival items that will be of interest to the involved aircrews.

- IMPROVED PERSONAL LOCATOR BEACON—This improvement involves the PLB in the F-4 and OV-10 and is the first to be installed in the A-7D. The hardware is a small package that fits into the seat pack survival kit with a control switch in the left front thigh support. The good things about it are that it provides the aircrew with inflight control, virtually eliminates inadvertent actuation and provides a timed battery. Production delivery is scheduled for this month (December).

- PRC-90 SURVIVAL RADIO —This has been a good radio but there were a couple of problems. The quarter wave antenna did not broadcast a desirable radiation pattern and the required range was not achieved; also the antenna was very sensitive to position (vertical) and body proximity. The improved radio will have a better range, and the sensitivity of the antenna to position and closeness to the body have been eliminated. TCTO and Kit release are pending contract award.

- T-37 SEQUENCED EJECTION CAPABILITY AND DUAL TRIGGER INSTALLATION— This modification was designed to protect the crew from severe windblast prior to ejection, assist in helmet retention and prevent disorientation due to windblast. The system incorporates a single motion canopy jettison and ejection with either hand. Kits are being delivered with completion scheduled for this month (December).

There are a number of other items in the works and as they approach reality we'll try to keep you informed. ★



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Major CHARLES E. BAERTL

16th Special Operations Squadron, APO San Francisco 96304

Major Baertl, aircraft commander, and his crew were on a night armed reconnaissance mission over heavily defended hostile supply routes in Laos. The *Spectre 21* crew had acquired a moving vehicle over an area of concentrated enemy activity. Approximately 20 seconds after rolling the aircraft into the firing orbit, a muffled explosion and bright flash were observed near the gunship's Nrs. three and four engines. The aircraft immediately pitched down and left. While the pilots were trying to regain control, the navigator provided heading and altitude information to exit the area and the flight engineer checked the aircraft systems. The two forward gunners rushed to assist the right scanner, who had been thrown from his position by the force of the blast. The remaining crewmembers reported to the aircraft commander regarding their status and that of the aircraft near their positions. After losing 2500 feet, the crew regained control and learned that the explosion had caused the immediate separation of the propellers and forward halves of Nrs. 3 and 4 engines. There appeared to be a fire around Nr. 3, so necessary precautions were taken. A controllability check determined a constant and gradual altitude loss, so all crewmembers not required at their stations began jettisoning 7460 pounds of ammunition and equipment, a task accomplished in less than 5 minutes. Proper facilities were notified of *Spectre 21's* situation once the gunship was over safe territory. The plane was configured for landing with no difficulty; however, at 12 miles from the base, the Nr. 2 engine instruments indicated the possibility of a turbine failure with imminent power loss. Therefore, careful throttle advancements were required to prevent the loss of a third engine. With the added problems of gusty winds on landing, only delicate, skillful manipulation of trim, power, and flight controls enabled the crew of *Spectre 21* to recover their aircraft safely and avoid almost certain personal egress injuries over the rugged Laotian terrain and the loss of a $6 million aircraft. The professionalism shown by every crew member of *Spectre 21* is deserving of the highest acclaim. WELL DONE. ★


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